EVALUATION

MOROCCO ENERGY DEMAND MANAGEMENT PROJECT

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Prepared for:

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Evaluation Team:

Harold Lubell
Alan Pashkevich

Submitted By:

Checchi and Company Consulting, Inc.
1899 L Street, N.W., Suite 800
Washington, D.C. 20036-3804

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Abbreviations

AMGE	Association Marocaine de la Gestion de l'Energie = Moroccan Energy Management Association
CIDA	Canadian International Development Agency
COP	Chief of Party
CTPP	Clean Technology and Pollution Prevention
Dh	Dirham
DSM	Demand side management
EDM	Energy demand management
ENIM	Ecole Nationale des Industries Minières = National School of Mining
ESM	Energy supply management
GEM	Gestion de l'Energie [et des Ressources Naturelles] au Maroc (Projet GEM) = Management of Energy and Natural Ressources in Morocco
GOM	Government of Morocco
IAV	Institut Agricole et Vétérinaire
MEM	Ministère de l'Energie et des Mines = Ministry of Energy and Mining
OFPPT	Office de la Formation Professionelle et de la Promotion du Travail = Vocational Training and Employment Promotion Office
ONE	Office National d'Electricité
ORC	Opération de réglage des chaudières = boiler tune-ups
ORE	Optimisation de la redevance électrique = electrical system analysis (literally: optimization of the electricity bill)
PACD	Project activity completion date
PP	Project paper

C'

t.o.e.	Tons of oil equivalent
USAID	United States Agency for International Development
WRS	Water Resources Sustainability Activity

EXECUTIVE SUMMARY

Project Background

USAID first identified the importance of energy demand management (EDM) in Morocco in the FY 1988 Country Development Strategy Statement. The USAID project paper and the project agreement for the Morocco EDM project (608-0193), signed on July 22, 1988, had a budget of $8.0 million, with a USAID grant of $5.0 million. A USAID contract for technical assistance was signed with RCG/Hagler, Bailly, Inc., in May 1989. A first amendment to the project agreement in July 1992 budgeted an additional $3.6 million to the grant, for a total of $8.6 million, and committed $2.0 million of it. A second amendment to the project agreement in September 1994 committed the final $1.6 million tranche of the grant.

The goal of the EDM project was to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco. The project purpose was to develop and implement the core of a national energy demand management program. An amplification of the project purpose emphasized private sector delivery of EDM technologies and services. Initially, three target sectors were selected: agro-industry, construction materials, and hotels; the scope was widened in 1992 to include other sectors as well. For each sector, the EDM project was to finance a series of coordinated activities, including: information and awareness campaigns (seminars, workshops, newsletters, study tours); technical support, to be carried out on a cost-sharing basis; U.S. and in-country training of plant managers, energy auditors, and engineers; and policy analysis. A clean technology and pollution prevention (CTPP) component was added in September 1993.

The project has moved from its initial emphasis on services to individual firms within several sectors to looking for more generalizable energy and natural resource conservation measures. This has culminated over the past several years in the training of the cement cell, the development of the tannery cell, and the large Demand Side Management (DSM) policy study and pilot activities. In moving from the specific to the general, the project has now developed the data base to undertake more replicable actions, actions which have interesting policy applications.

The changes in the project since 1988 reflect its adaptation to Moroccan conditions and increased awareness that the expanding Moroccan private sector responds to economic incentives. The project has successfully implemented the USAID Mission's decision to place increased emphasis on the private sector for achieving project goals by sensitizing businessmen to the financial returns to EDM/CTPP and by training Moroccan engineers in the private sector to carry out EDM/CTPP activities. The project has been remarkably innovative in incorporating private sector entities both as implementors and as beneficiaries.

The project contractor, Hagler Bailly, gave the project the name GEM (Gestion d'Energie au Maroc), an acronym that is now widely recognized in the Moroccan business community as the USAID program dealing with energy demand management.

Deliverables

The long list of deliverables in the project paper has been progressively modified and extended, the definitions of some of the items in the list have shifted, and the quantities called for have been adjusted several times, most recently to incorporate targets for the clean technology and pollution prevention (CTPP) component added to the project in 1993. Since the project will be extended at least three months beyond the current LOP, there is still time to meet some of the unfulfilled targets; but it will now be necessary to set priorities for choosing which ones.

Among the project's information and promotional activities, the numerical targets for information packages and technical publications have been met or exceeded and the Energy Management Association has been established and is functioning. The numerical target for awareness seminars and workshops, including the CTPP component, has not been met, and only one of three document centers has been established. One of the document centers not yet established is that for the Ministry of Energy and Mining, the counterpart GOM ministry for the project.

Under the technical support heading, the target for what are now called audits has not yet been met, in part because of modification in the definitions of audits and feasibility studies; but if the targets for audits and feasibility studies are added together, the combined target has been exceeded. The audits that have been carried out have generated considerable publicity and have sensitized other businessmen to the financial benefits to be derived from reducing energy waste and improving efficiency of energy use, thus contributing indirectly as well as directly to eventual achievement of one of the main project goals. As of May 1995, the numbers of boiler checks (ORCs) and electrical bill analyses (OREs) implemented were considerably short of their targets.

Under the training heading, the targets for seminars and workshops, in-country hands-on training participants, and in-country training courses for ENIM and other educational institutions have been exceeded or met. The targets for U.S. short courses and internships in the U.S. and study tours to the U.S. have not been met.

Policy analyses are especially under target, mostly because of difficulty between USAID and the MEM in identifying suitable topics that would lead to enforceable regulations, given the timing and available funding.

Project Impacts

The EDM/CTPP project has had a variety of positive impacts: sensitization of businessmen and public sector officials to the benefits of EDM; reduction in enterprise costs and improvement of enterprise finances because of GEM audits and feasibility studies, boiler tune-ups, and electrical system analyses; technicians trained; reduction in pollution, directly by reducing factory

emissions and indirectly through reducing consumption of fossil fuels for energy. GEM's electrical systems analyses have been especially effective, since they generate savings 10 times the cost of the intervention.

The evaluation team carried out interviews in May 1995 with plant managers and production engineers of a sample of factories and hotels that have been clients of GEM, in order to get their reaction to the GEM program. Most of the EDM/CTPP knowledge in Morocco seems to be traceable to GEM. GEM's information and awareness campaigns sensitized enough plant managers to have made energy demand management a coffee house topic among Moroccan businessmen. On the whole, GEM's interventions at the plant level are perceived as effective and cost-saving by the plant managers interviewed. GEM's audits and hands-on training were also highly appreciated. One technical manager said that the in-plant training provided to his technicians was by itself worth half the price of the audit. Another remarked that the GEM engineers were so practical that accompanying them on the audit was itself a valuable use of his time.

GEM is to be credited with having (a) accomplished many good projects in a short period of time, (b) made "energy audit" a commonly used word both in and outside the target sectors, (c) provided simple tools and methods by which engineers can quickly and accurately analyze and quantify energy use and identify means of saving money and (d) trained Moroccan engineers to make practical use of their calculations to focus on the goal of identifying savings rather than applying the more academic Moroccan/French approach of focusing on the detail and presentation of the calculations.

GEM energy audit reports usually make two sets of recommendations: those that do not require acquisition of equipment, and those that do require investment in new equipment. Postponement of implementation of all or part of the GEM recommendations has been frequent when significant investments are involved. As a result, only part of the potential savings identified in the audit reports have been realized. The evaluation team's estimate of total actual savings generated directly by the project comes to 16,000 t.o.e. and 41 million Dh per year.

The addition of the clean technology component to the project made explicit the synergy between energy audits and pollution prevention. One of the more successful GEM interventions was in a paper factory in Tangier whose visible pollution problem was solved at the same time that its energy consumption was reduced. The episode had the interesting side effect of reducing the Moroccan businessman's normal concern with secrecy to the point where GEM was able to use the plant as a demonstration project, organizing visits of groups of businessmen and (even more remarkably) government officials.

Sustainability

Despite general knowledge of GEM's successes, the market is not yet driving businessmen to include EDM/CTPP technologies and techniques as part of their cost-control strategy. On the supply side, there are now Moroccan engineering consultants trained in EDM/CTPP techniques,

but commercial demand for their skills is lagging. Except for the cement industry and hotels, where energy costs are high and the possibilities for energy saving are obvious, energy conservation is not perceived as a good return on investment (and in the case of hotels, the slump in tourism as a result of the Gulf War caused a major liquidity crisis which has obliged many of them to postpone investment expenditures). EDM/CTPP engineering consultancies at the GEM level of intensity look expensive to potential clients, especially as the USAID subsidy has been reduced.

Unless private sector energy engineering consultants can substantially reduce the costs of their services below those of GEM, they will have even more difficulty than GEM in finding a market for their services. It seems to the evaluation team that the time spent on GEM audits, and therefore their cost, could be reduced in many cases without reducing their quality. Another possibility that may be feasible is to take a lighter approach to initial audits, identifying the most obvious places to conserve energy, and keeping the audit cost under 20,000 Dh. At that price, initial energy audits would probably be easier to sell, and the results might well convince clients to contract follow up consultancies.

In the short run, there is unlikely to be sufficient demand to support small engineering consulting firms that limit their activities exclusively to EDM/CTPP concerns. The engineers who have acquired energy expertise through their association with GEM will have to incorporate their skills into broader scope engineering consulting firms that provide energy management services as only one element of their activities. The Water Resources Sustainability Activity (WRS) successor to USAID's EDM/CTPP project might be able to direct some of its sub-contracting to smaller firms that have already retained engineers trained by GEM or will do so once the present EDM project ends.

Creation of industry cells looks like a good way to institutionalize sustainability. Industry cells can promote EDM/CTPP technologies and services as well as serve as an industry resource for negotiating regulatory policy. The thermal balance activity of the cement industry cell is a GEM-sponsored activity that will carry on under its own momentum. Establishment of a tannery cell is currently under discussion in Fes. There are other sectors that should be urged to create technical cells of a similar nature.

Lessons Learned and Recommendations

One of the first lessons learned from the EDM/CTPP project is that innovative approaches for implementation through private sector entities can be effective in Morocco. GEM's dealings with private sector clients and sub-contractors bear that out.

GEM's promotional activities such as awareness seminars and the publicity given to the project's successful interventions through the media (press and television) and the GEM-O-GRAMME newsletter, were effective in making energy conservation a familiar concept to Moroccan businessmen. The same approach should be incorporated into USAID's follow-on WRS Activity.

A CTPP/WRS newsletter similar to the GEM-O-GRAMME should be funded by the future project.

With hindsight and what we know now of the dynamics and the actual experience of the EDM/CTPP project, we suggest that it would have been useful to specify from the beginning the extent to which the twin goals of saving foreign exchange and increasing productivity by improving efficiency of energy use were short term or medium term goals. The distinction is relevant for the internal balance of the project in respect of the importance given to factory interventions as opposed to promotional activities. Audits did have an immediate impact on energy consumption in the short term, but their coverage was necessarily limited (although their secondary impact may have been of considerable importance precisely as a promotional tool). The consciousness raising among businessmen achieved by the wide coverage of GEM's promotional activities may well have a greater impact in the medium term. From that point of view, any controversy over the number of audits and feasibility studies actually carried out over the life of the project is a bit futile.

It is possible that less intensive and therefore less expensive audits might have been preferable to the detailed audits carried out by GEM. Managers might be willing to risk 10,000-20,000 Dh for an audit on the possibility of getting an interesting return; they are reluctant to go above that ceiling without careful consideration. Keeping down the unsubsidized cost of project interventions for which the private sector is supposed to pay is another theme that should be incorporated into any follow-on project.

In view of the short time available to the GEM project even if the LOP is extended without additional funding, priorities should be set for the activities to be carried out before the revised LOP. The number of audits called for in the last contract amendment should be reduced and efforts focused on other activities.

Before closing down, the GEM project should try to get follow-up structures similar to the cement cell established in other sectors. For example, GEM could try to convince the hotel industry association to establish a technical subcommittee of hotel engineers, a group that is already sensitized to EDM/CTPP matters.

Project engineers have mentioned that a data base of all of GEM's clients is due to be completed in the July 1995 time frame. Hopefully, the contents can be compared with details of the 1990 survey data. The final demand side management exercise will provide an electricity survey and analysis.

The evaluation team has several recommendations for developing the market for a follow-up of EDM/CTPP services:

(a) Explore with USAID and the MEM ways to place GEM project measuring equipment in the care of a government or non-governmental entity, such as the Ecole Nationale des Industries Minières (ENIM) or the Moroccan Energy

Management Association (AMGE), that could lend the measurement equipment to the private sector or lease it at reasonable rates.

(b) Continue development of the tannery cell along the lines of the cement cell. The USAID Water Resource Sustainability (WRS) follow-on activity should be an ideal vehicle for that.

(c) Assess the manpower needs of the USAID WRS follow-on project, develop its job descriptions accordingly, and allow the GEM engineers an opportunity to compete for those positions in view of their relevant work experience.

(d) Assist AMGE (and other appropriate associations) in conducting occasional seminars on energy awareness and GEM project follow-up and case studies. USAID's Training for Development project has expressed interest in supporting chambers of commerce, professional organizations, and private firms that undertake such activities.

(e) Efforts to promote awareness of potential savings from EDM/CTPP services and technologies should be given high priority by the project in the remaining project period.

I. PROJECT DESCRIPTION AND BACKGROUND

Morocco's energy consumption is dependent on imports, which supply 93% of commercial energy. In 1985, prior to the formulation of USAID's Energy Demand Management (EDM) project, Morocco's commercial energy import bill came to almost $1.0 billion or nearly half of the country's foreign exchange earnings. Despite the decline in oil prices in 1986 and the present prospect of tapping into the gas pipeline from Algeria to Spain when it is completed in 1996, energy saving through energy demand management remains a practical and least cost option for Morocco.

USAID first identified the importance of energy demand management in Morocco in the FY 1988 Country Development Strategy Statement. A project feasibility study, prepared by RCG/Hagler Bailly Inc. and issued on May 29, 1987, proposed a seven-year project with a budget of $12.9 million, of which the USAID contribution would be $9.0 million. The USAID project paper and the project agreement for the Morocco EDM project (608-0193), signed on July 22, 1988, had a budget of $8.0 million, with a USAID grant of $5.0 million, limiting the focus of the project to only three sectors: agroindustry and food-processing, construction materials, and hotels. The contract was for 36 months, with a 16 month extension subject to the results of a mid-term evaluation. The mid-term evaluation carried out in 1991 by Research Management Associates of Madison, Inc. was positive.

A first amendment to the project agreement in July 1992 budgeted an additional $3.6 million to the grant, for a total of $8.6 million, and committed $2.0 million of it. The text of the amendment removed the 3-sector limitation on the scope of the project. The contract with Hagler Bailly was again modified in September 1993 to add a Clean Technology and Pollution Prevention (CTPP) component to the project. A second amendment to the project agreement in September 1994 committed the final $1.6 million tranche of the grant.

The goal of the EDM project, as defined in the 1988 project paper, was to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco. The project purpose was to develop and implement the core of a national energy demand management program. One amplification of the project purpose in the project paper (in the Evaluation Plan section) refers to establishment of an institutional capability in Morocco, "especially in the private sector", to deliver EDM technologies and services.

For each of the target sectors, the EDM project was to finance a series of coordinated activities, including:

(1) Information and awareness campaigns (seminars, workshops, newsletters, study tours):

(a) energy demand management information packages;

(b) seminars and workshops;

(c) a biannual technical publication and brochures;

(d) an annual survey and establishment of a data base;

(e) information centers;

(f) establishment of an Energy Managers Association;

(g) study tours.

(2) Technical support, to be carried out on a cost-sharing basis:

(a) firm-specific audits;

(b) techno-economic feasibility studies of potential investments for specific energy demand management interventions. As noted in section II below, there is some ambiguity as to what constitutes an energy audit and what constitutes a techno-economic feasibility study;

(c) technology applications, such as replacement boilers, heat exchangers, and cogeneration systems. Boiler tune-ups and electrical system analyses are significant technology applications specified in the Hagler Bailly contract;

(d) Demonstration projects were not specified as project outputs either in the project paper or in the project agreement; they are specified, but not defined, in the Hagler Bailly contract.

(3) U.S. and in-country training of plant managers, energy auditors, and engineers

(a) U.S. short courses and internships;

(b) in-country programs:

(i) intensive courses;

(ii) hands-on training;

(iii) curriculum upgraded for the Ecole Nationale d'Industrie Minière (ENIM).

(4) Policy analysis (e.g. technical and policy oriented studies on Moroccan manufactured products, taxation, and standards).

The scope of work for the September 1993 modification of the Hagler, Bailly contract to include a CTPP component makes no mention of a "goal". Its "objectives" were: (i) to help introduce clean technology to Morocco as an effective cost saving investment for industry; (ii) to assist in creating an awareness of CTPP services and equipment; and (iii) to provide Moroccan engineers with the skills to sustain project activities after the PACD. The contract modification introduced specific concern with sustainability into the project.

The CTPP component added as deliverables: training for Moroccans, CTPP information bulletins, environmental audits, system audits (housekeeping recommendations), installing a real time link with EP3 database of providers of CTPP services and technologies, developing a course for ENIM, organizing a seminar, providing demonstration projects, sending Moroccans on a U.S. study tour, and preparing an additional policy analysis.

The changes in the project since 1988 reflect a certain adaptation to Moroccan conditions and increased awareness that the expanding Moroccan private sector responds to economic incentives. Not only was the market was not well known when the project was initiated, it was constantly evolving in response to policy changes such as increased liberalization and to external events such as the Gulf War and drought. The project emphasized use of the private sector for achieving project goals by sensitizing companies to the financial returns to EDM/CTPP and by training Moroccan engineers in the private sector to carry out EDM/CTPP activities.

Section II below discusses the deliverables included in the 1988 project paper and subsequent work plans. Section III focuses on project impacts. Section IV discusses sustainability.

II. DELIVERABLES

In this section a listing and discussion of project deliverables are presented. The tabular listing below is given as an overview of project activities but by no means pretends to portray the impact of the project on EDM and CTPP in Morocco. One of the largest intangibles not shown in the table is the project's effect on awareness of EDM and CTPP for Moroccan managers and technical personnel. Before Projet GEM, EDM/CTPP was seldom considered by hotel and industry managers. With five years of project awareness activities and services as well as significant media exposure of the project, EDM/CTPP is discussed widely and in many circles in Morocco. Project activities have been assisted by the desire of local companies to cut costs in order to better compete in export markets, energy price increases, concern over proposed environmental legislation and the anticipation of increased competition as more state-owned enterprises are privatized.

In 1988, the project was conceived as an energy conservation project to assist three target sectors. Originally proposed as a $12.9 million project with an additional $10 million line of credit to implement project recommendations, the project was approved at $8 million without the line of credit (an economist contracted by USAID at the time wrongly determined that availability of financing was not a barrier to implementation). The deliverables listed in the 1988 project paper are contained in column 1 of the following table. They fall under the general categories of promotion, technical support, training and policy analysis. The ensuing discussion follows the same division.

The second column of the table gives project accomplishments as of the mid-term evaluation. This column is given as a reference of program accomplishments as of the second half of 1991. Fields are left blank where the mid-term evaluation document did not make reference to the deliverable.

In 1992, an amendment was concluded that added $3.6 million to the project budget as well as additional deliverables in all categories. It is in this amendment that boiler tune-ups (ORCs), electrical bill analyses (OREs), and implementation analysis of project technical activities were added. This amendment also redefined what constitutes an audit and what constitutes a feasibility study. Targets were set accordingly and are given in the third column. The amendment also provided additional personnel for the project.

In September 1993, the Clean Technology and Pollution Prevention (CTPP) component was added and included additional funding $1.6 million. It added additional personnel and equipment

to implement the CTPP activities and specified that existing targets were to be met but with a CTPP emphasis. It also added a real time link with the EP3 database in the US that was to be used to support CTPP activities. The fourth column reflects these changes and contains the total deliverables due at the end of the project. The Demand Side Management (DSM) amendment expected in July 1995 may alter these numbers.

The last column is the evaluation team's accounting of project deliverables as of May 1995 as determined from project records and conversations with project personnel.

	(1) Project Start Target	(2) Midterm Actual	(3) 1992 Contract Amend.	(4) CTPP Contract Amend.	(5) May 1995 Actual
A. Promotion:					
1. Info packages	3	-	6	6	10
2. Sem. & wrkshps	45	5	10	10	7
3. Tech publs	10	2	16	16	19
4. Energy survey	5	-	-	-	1
5. Info centers	3	0	3	3	1
6. Ener Mgr Assoc	1	-	1	1	1
7. MEM doc center	-	-	1	1	0
8. Info brochures	-	-	1	1	1
9. Trans. plan	-	-	1	1	1
B. Technical Support:					
1. Audits	40	8	76	76	47
2. Feas. studies	45	111	145	145	349
3. Demonstr proj	15	1	5	15	2
4. ORC	-	10	85	85	66
5. ORE	-	10	120	120	115
6. Follow-up	-	-	40	40	33
7. New services	-	-	2	2	2
8. Devpt of new private sector service firms	-	-	2-4	2-4	1+
9. EP3 Database	-	-	-	1	1
C. Training:					
1. US (particip.)	30	-	30	30	3
2. Study tours	5	-	5	5	4
3. Sem. & wrkshps	150	180+	560	560	632+
4. Hands-on	400	-	400	400	526
5. ENIM & other education inst.	1	-	3	3	3
6. Mgmt training	-	-	2	2	-
D. Policy Analysis:					
1. Studies	4	-	10	10	3

The ORCs and OREs in the table above include activities carried out during energy audits (20 ORCs and 27 OREs). GEM includes two other studies in its count of energy surveys: the Techni-Project Cogeneration Study, and Upline's study of the Market for Energy Savings in Morocco.

It should be noted that the life of the project included the Gulf War and a period of blackouts due to insufficient electrical generating capacity. Not only did the Gulf War result in the evacuation of the project's expatriate staff and a slow down of project activities, but it also hurt project target sector companies, especially hotels. The power outages caused plant managers to lose sight of energy conservation and instead to focus on means of providing power during the outages.

The following is a discussion of each of the deliverable categories, their evolution over time, and the current state of implementation.

A. Promotion

1. EDM Information Packages

The 1988 PP envisaged three separate energy demand management (EDM) packages, each designed for a separate target sector: hotels, building materials, and agro-industry/food processing (called agro-food hereafter). An EDM information package was published for the hotel sector. Later on, a decision was made to base the technical manuals and workshops on techniques and technologies that crossed sectoral boundaries. The target number of packages was set at six which the project has exceeded.

In their current form, the EDM manuals are: Energy Management for Hotels, Energy Management, Boiler Efficiency, Electrical Systems, Steam Systems, Energy Efficiency in Cooling and Refrigeration Systems, Usage Manual for the Cement Plant Thermal Balance Computerized Model, Manual for the Bio-Climatic Concept in Hotels, and Users Guide for Computerized Energy Management Systems. A CTPP manual called Natural Resources Management has also been produced. It should be noted that each of these manuals were developed for workshops that the project held and contain significant practical technical information and techniques in addition to the promotional content.

2. Seminars and Workshops

The 1988 PP envisaged seminars and workshops as awareness activities to promote the concept of EDM. The first of the awareness seminars (**rencontres de sensibilisation**) was held in collaboration with the Ministry of Energy and Mining (MEM) and the Office National d'Electricité (ONE) on 26 February 1990 in Agadir and was directed towards the hotel industry. This seminar, like the technical seminars, was well received and generated significant interest in EDM. While not a primary goal of the seminar, it appears that a hotel audit directly resulted from contacts made at the seminar. A total of seven regional seminars have been held to date as shown in Exhibit 1.

Concurrently with these seminars, the project promoted EDM through presentations at the regional chambers of commerce and industry, at professional associations and through their technical workshops. Additionally, the mass media was used to promote EDM/CTPP concepts and technologies. For example, the SAFRIPAC (a paper company that received both energy and environmental assistance and has been used as a "demonstration" site for promoting EDM/CTPP activities in seminars and workshops) audit was written up as a case study and appeared in the July 16, 1993 issue of "La Vie Economique," a local business periodical. As a result of the article, several companies contacted GEM for further information; at least one of them requested an evaluation visit.

In late 1993, the project was invited to a live interview on Moroccan Radio. Project activities and accomplishments to date were presented. SAFRIPAC was contacted live on the show and was very complimentary towards the GEM team and the assistance received.

After the CTPP promotional seminars were held in Agadir and Marrakech in 1994, GEM was featured on the evening television news and several newspaper articles appeared. A clean technology presentation in Arabic was televised on the Ecologia program. A complete listing of these mass media activities is given in Exhibit 2.

Besides being instrumental in the formation of AMGE, the Moroccan Energy Management Association, GEM is also in regular contact with sectoral business associations such as the Hotel Industry Association. GEM has been active in promotion industry "cells" in the cement and tanning industries.

3. Technical Publications

The 1988 project paper calls for 10 "biannual publications" (e.g., 2 semi-annual publications for 5 years). The project developed the GEM-O-GRAMME to meet this deliverable. The GEM-O-GRAMME includes subjects from the technical manuals previously mentioned, cites case studies from clients, advertises upcoming project events and the like. The GEM-O-GRAMME has been published 4 to 5 times annually since May 1991. The GEM-O-GRAMME began with 4 pages and was later expanded to 8 pages. CTPP material has been added to the GEM-O-GRAMME since the March 1994 issue, expanding it to its current 12 pages. The GEM-O-GRAMME publication dates and distribution are given in Exhibit 3.

The initial focus of the GEM-O-GRAMME was on simple EDM techniques. With time it began to include more case studies and process analyses. The GEM-O-GRAMME editor started a column called "GEM Games" to get feedback on readership interest and understanding of the concepts presented. Prizes such as free seminar admission are awarded successful contestants.

4. Energy Survey

The energy survey was intended as an annual survey of specific energy consumption by target sector which was to be updated annually for a total of five deliverables (one database with 4 updates). The

purpose of the data base was to "provide information used to track project activities and monitor project progress" and was to be used as follows: "The Planning and Documentation Unit at the Ministry of Energy and Mines will incorporate the EDM data into the national energy documentation center of MEM and share the data analysis responsibilities with the technical assistance contractor" (1988 PP, p.15).

A consultant was retained by GEM in 1990 and a data base was developed for the three target sectors through a sample survey of energy consumption by hotels and industrial enterprises. The questionnaire covered a number of technical features of each facility and its energy consumption by type of energy during the period 1985-1989. The results were tabulated but do not appear to have been analyzed. The survey has not been repeated since 1990 so the data base has not been updated. According to the present GEM chief of party, the results were not accurate enough to compare specific energy consumption between same-sector facilities.

The 1992 amendment does not make specific mention of the energy survey and does not include it in the deliverables list. In the meanwhile, other useful data have since been developed by GEM.

The existing project database includes Quattro-Pro spreadsheets derived from GEM interventions: energy audits, boiler tune-ups (ORC), and electrical analyses (ORE). The data base includes company name, sector, location, recommended savings in cost and energy, and payback period. Project engineers have mentioned that a unified data base of all clients is due to be completed in the July 1995 time frame. This data base will contain all the information available in project summaries of audit, ORC and ORE clients, as well as mailing list contacts and potential clients for whom proposals have been made.

More recently, an electrical systems analysis survey of 20 plants was carried out in Tangier in anticipation of the demand side management (DSM) pilot project.

5. Information Centers

Information centers were to be established in schools and trade and professional associations. Assistance includes purchase of books and reference materials and subscriptions to periodicals. The project maintains cordial relationships with a number of trade and professional associations. GEM has a library of useful publications that is open to public and private sector consultants and GEM clients.

The MEM was to have been the recipient of an information center according to the project paper. It was subsequently listed as a separate line item in the 1992 amendment deliverables list (see below). GEM will transfer its own information center to the MEM at the end of the project. Documentation has been provided to ENIM.

6. Energy Management Association

The project assisted in the establishment of an Energy Management Association as called for in the project paper. The Association Marocaine de la Gestion de l'Energie (AMGE) has over 75 members from 40 national companies and includes six foreign firms.

GEM assistance to the AMGE after initiation of the organization was primarily printing, logistics and the time of GEM personnel. One of the more significant activities undertaken by AMGE was the organization of a two-day symposium in 1992 on the industrial use of propane which was attended by 65 persons and at which GEM staff made a presentation. AMGE also sponsored a one-day seminar on Tiers Investisseur (third-party investment) in 1993, and co-sponsored a seminar on cogeneration in 1994 and another on gas in 1995. A complete listing of AMGE activities is given in Exhibit 4.

7. Ministry of Energy and Mining (MEM) Documentation Center

To date a documentation center has not been established in the MEM. At the end of the project, GEM plans to turn the GEM library over to the MEM. Over the course of the project, GEM has sent multiple copies of all project reports, documents and reports to MEM. GEM has also paid for subscriptions for MEM.

8. Information Brochures

GEM has produced a project information brochure and several other information brochures on energy demand management.

9. Transition Plan

The transition plan was added by the 1992 amendment. It was developed with the help of an outside consultant and focused on how to leave behind viable private sector activities that will continue after PACD. The recommendations were 1) extend the project and combine it with a follow-on project, 2) link Moroccan consulting firms with outside vendors to serve as manufacturers' representatives, thereby getting around the problem of not being paid for information only, and 3) retain major Moroccan consulting firms who would acquire EDM/CTPP expertise (e.g., hire GEM engineers) and keep them available for EDM/CTPP services as the local market matures.

B. Technical Support

1. Audits

The distinction between an audit and a feasibility study has evolved during the life of the GEM project. As envisaged in the 1988 project paper, an audit was to be an initial visit to a facility to determine in what areas there might be a potential to conserve energy and to attempt to give a rough estimate of savings and investment. Based on this document an in-depth feasibility study would be

performed which would detail savings, implementation methodology, and investment. By the time of the final evaluation, GEM's quarterly reports and annual work plans were defining a feasibility study as any recommendation that was worth detailing in a traditional audit. The detailed reports sent to the clients have been labeled "audit reports" since the first client was provided this service.

The 1992 amendment divides audits into "in-depth" and "simple" audits with 36 and 40 to be performed, respectively. This distinction could not be sold to clients who were not able to understand the distinction. What the clients wanted was the best audit at the lowest price. The simple audit was perceived as not the best audit and the in-depth audit was perceived as overly costly. The distinction was dropped.

As the mid-term evaluation report points out, the contractor chose to implement the traditional interpretation of an energy audit which includes feasibility studies as part of the audit. Using the traditional definition the project has initiated 47 audits to date, 40 of these being completed and 3 more waiting for final comments from the clients. Four of the 47 audits were limited specific studies that the client facility wanted: (a) an technical-economic comparison for a new boiler, (b) detailed electrical analyses (two facilities), and (c) detailed measurement of process parameters and energy flows. Of the 43 other audits, four were specifically environmental, seven combined energy and environment, and the rest concerned energy only. The audits undertaken to date appear in Exhibit 5.

The following thermal systems are reviewed in an audit: boiler efficiency (oxygen level, carbon monoxide level and temperature of stack gases including a smoke spot), amount of returned condensate, rate of blowdown and level of suspended solids, insulation amount and quality, functioning of steam traps, and potential for heat recovery. Electrical systems begin with a review of the electrical bills for subscribed vs. actual demand, power factor on peak demand, then demand by contributor, lighting, motors (size, loading, power factor), and distribution systems.

An environmental audit identifies and quantifies the process inputs and outputs and attempts to establish a flow balance. If the non-productive outputs (wastes) have value or environmental impact, methods of reducing or re-using them are explored. Taking a tannery as an example, water, salts and chrome would be tracked through each stage of the process with a balance performed at each step.

The audit reports are, in most cases, fairly detailed and well-presented. Use of energy and water, and other process inputs as appropriate, is quantified and subdivided according to use. There is wide variety in level of detail between reports, however. This appears to be due to, in some cases, the differing needs of each facility. In particular, a number of reports do not give investment in any more detail than a number that would be used in a budget estimate. In other much less frequent instances it would be helpful to facility technical personnel to give example calculations to better explain computer spreadsheets used in the analysis. According to the GEM chief of party, all audit reports are reviewed by the project's entire engineering staff.

Another purpose of an audit report is to sell implementation services. At one point in the life of the project, audit report information was turned over to a private sector firm which would then try to follow up implementation with the client. The project seeks to maintain contact with former clients in order to help them implement recommendations by providing information or technical assistance.

The audits were initially subsidized at 75 percent, then at 50 percent after a period of time; they are now subsidized at 25 percent. Sometimes the client does not pay all or any of their portion. The project has collected to date 81 percent of the clients' portion of the audit costs or 33 percent of the total proposed cost of the audit. Non-payment by some of the larger early clients made it necessary for GEM to require 50 percent payment in advance and the balance due upon delivery of the report. This has reduced the amount of money not recovered due to non-payment and has prevented some audits from being undertaken.

The first stage of an audit is the preparation of a proposal of audit work and cost developed from a site visit. The number of proposals by year and outcome is given below:

	Audit acceptance	Audit rejection	Other project service
1990	8	-	-
1991	6	1	-
1992	9	8	3
1993	14	21	2
1994	2	28	1
1995	2	17	1

There are a number of reasons why a potential client may not request an audit after a proposal is presented such as 1) the audit is perceived as too expensive, 2) the returns on investment are not perceived as attractive enough, 3) the client does not trust the accuracy of the proposed energy savings, and 4) what is proposed is not what the client thinks is needed.

2. Feasibility Studies

Originally intended to be either what is traditionally termed an energy audit or a detailed techno-economic study of a potential opportunity uncovered during a cursory (one-day or walk-through) audit, the feasibility study had become any recommendation that was worth detailing in a traditional audit (as in section II.B.1 above) by the time of the mid-term evaluation. It appears that this definition still holds; but it is of no real value since an energy auditor can, for example, write up all the lighting changes under one heading or divide them according to location (parking lot, office, production area, warehouse) or type of lamp and technology (high pressure sodium, fluorescents, compact fluorescents, timers, additional switches, etc.). A review of the audit reports indicates that by a different division of recommendations, the project could probably count significantly more feasibility studies. At present the project counts 349 feasibility studies.

3. Demonstration Projects

Demonstration projects are intended to increase the probability that skeptical firms will implement EDM/CTPP technology by (a) providing financing for the implementing facility and (b) allowing other firms access to see the technology in action and to learn from the experience of the implementing facility. Demonstration projects were not clearly defined in the project documentation; nor was there a clear definition of what was to be delivered and how it would contribute to project goals. The present GEM chief of party defines as a demonstration project any project that promotes EDM/CTPP goals, has general interest, is applicable to a number of facilities, and is accessible to personnel from other facilities. GEM's demonstration projects on this definition are listed below.

GEM Demonstration Projects

Demonstration	Location	Notes
Energy-efficient lamps	Beach Club Hotel Agadir	Beach Club selected because it is a trend setter in the Agadir hotel industry.
Water-saving shower heads	Beach Club Hotel Agadir	
Reverse osmosis	COTEF, Fes	Publicly held company and open to visitors. Installed by ADS.
Computerized energy and water management system	ODEP, Casablanca SBGS, Agadir Beach Club Hotel, Agadir	Tracking system using manual inputs for water and electricity. Beach Club has limited version.
Expert system for cement kiln operation	CIOR, Fes	State of the art control center for cement industry. Being installed at present.

The project has not financed or purchased any of the above demonstrations, although such financing is permitted and encouraged in the program agreement. All demonstration equipment is purchased directly by the end user. The project chief of party believes that this gives greater credibility to the economic feasibility of the demonstrations. It is for this same reason, however, that he believes three other applicable demonstrations have yet to be undertaken (waste heat recovery from refrigeration, variable speed drives, and solar water heaters).

As part of its DSM component, the project will fund three additional demonstrations in power factor correction, residential lighting, and public (street) lighting.

Other projects that have been referred to as demonstration projects in conversations with GEM personnel or in the COP's comments to the mid-term evaluation include (a) power factor correction, (b) use of boiler combustion efficiency measurement equipment, (c) bioclimatic hotel design (design completed but not constructed), (d) hotel energy demand monitoring system (Safir in Agadir) and (e) cement kiln thermal and mass balance model.

4. Boiler Tune-Ups (Opération de Réglage des Chaudières = ORC)

The boiler tune-up component was added in 1990 to "reap the benefits of perhaps the most common energy efficiency measure in both the industrial and hotel sectors" as explained on page 58 of the 1990 Work Plan. The ORCs are provided free to the client to 1) promote energy awareness, 2) demonstrate immediate savings, 3) reduce Moroccan use of imported oil, and 4) generate interest in other project services. ORCs have been performed at 9 sites that also received an audit or ORE at another time.

ORCs have been performed by GEM and three subcontractors since 1990 for a total of 46 ORCs to date. ORC clients and savings data appear in Exhibit 6.

An ORC consists of adjusting the boiler burner air/fuel ratio to achieve optimal combustion. Frequently the burner is disassembled and cleaned. Worn or damaged parts are replaced at the expense of the client.

In addition to the boiler tune-ups undertaken by the ORC program, boiler tune-ups (adjustments only, not burner disassembly and cleaning) are frequently performed as part of an energy audit. GEM counts 20 such ORCs to date. These may have been counted in the contractor's most recent quarterly report (4th Quarter 1994) but the number given by the evaluation team in Exhibit 6 reflects only those tune-ups done under the ORC program. To do otherwise would be double counting project outcomes.

One project engineer remarked that boilers deteriorate to their previous state about 3 months after a tune-up. Foreseeing this, the project initiated a program of boiler tune-up kit leases in 1990. 40 kits were purchased for about $600 each (as per a quarterly report) and 26 have been leased for a two year period for $250 - $350, depending on the client and the exchange rate. Interviewees mentioned that they tune up their boilers at a frequency varying between one week and one month. However, because the majority of facilities receiving ORCs do not appear to maintain their boilers in tune, savings accredited to the ORC program should reflect a one-time savings assuming linear boiler performance deterioration over 3 months. Unfortunately, the engineering service firms that perform the ORCs report that there is no repeat market after an ORC has been performed. Reasons for this lack of a market include that the clients do not appreciate the savings to be realized from periodic tune-ups, the clients perform their own tune-ups, and the companies providing boiler tune-up services have not tried to market their services on a repeat basis.

It had been assumed by GEM staff that ORCs and OREs result in audit clients but a review of clients assisted by GEM show that only one client had an ORC in addition to an audit and five had OREs in addition to an audit (one being the same as had the ORC). It does seem to be true, however, that OREs included in an audit proposal do show sufficient potential savings to help sell management on the audit.

5. Electrical Systems Analyses (Optimisation de la Redevance Electrique = ORE)

The reasons for the initiating the ORE program were presumably similar to those for ORC but were not spelled out as clearly. The ORE makes it possible to reduce the electricity bills of an enterprise by adapting current to the real needs of the enterprise. An ORE examines three areas: 1) the subscribed demand versus the actual demand, 2) power factor, and 3) on-peak demand. Facilities pay for subscribed demand, whether they reach that demand value or not, and pay a penalty for exceeding subscribed demand. Likewise, penalties are assessed for low power factor, a condition correctable by installation of capacitors. The "power factor" is defined as the ratio of actual useful ("real") power available to maximum useful ("apparent") power available. "Real" power is less than "apparent" power to the extent that electric current waves are out of synchronization with (usually lagging behind) voltage waves. Thirdly, demand which can be moved off-peak (to a time when the utility is not generating near full capacity) is charged at a lower rate than on-peak.

One very important side benefit of the OREs is that businessmen were taught that electric bills are not fixed costs but can be controlled by production management.

The ORE program was developed with the assistance of a private contractor during a pilot phase. Project staff took over the marketing and implementing of OREs after the pilot phase. The contractor continues to perform OREs but finds the market soft. He doesn't do any marketing: his main line of business is government-funded mandatory electrical safety inspections.

The project has performed 88 OREs to date either directly or through a subcontractor as shown in Exhibit 7. The client presently pays 10 percent of the amount saved up to a maximum payment of 5,000 Dh initially and 10,000 Dh since the ORE workshops (including training in reading electric bills) were started. The project has developed a computer program that allows analysis of energy bills in less than a half person-day. The average ORE costs 6-7,000 Dh. The ORE may turn out to be the most cost-effective and sustainable component of the project, saving nearly 13 times the cost of the analysis.

The components of an electrical bill analyses are frequently performed as part of an energy audit. GEM counts 27 performed as part of audits to date. These are not counted in the deliverables total table as it would result in double counting outcomes. In at least one case, it was the potential "ORE" savings presented in the audit proposal convinced the client to buy the audit.

6. Follow-Up Audits and Other Technical Activities

Follow-up evaluations of technical activities by GEM were not requested by the 1988 project paper but added in the 1992 amendment. Follow-up evaluations, sometimes called implementation analyses, are very useful in determining the actual effects of the project recommendations on savings to the client. Follow-up evaluation completions are detailed in the GEM quarterly reports. An evaluation report details 33 facilities divided into the original three target sectors and "others." There has not been any methodical follow-up to the ORCs and OREs to date.

7. Development of New Services

The 1992 amendment added two deliverables under the heading of development of new services. One of these is the computerized energy management system (**système de gestion d'énergie**) (SGE) originally developed for the hotel industry. The other is the computerized ORE electrical bill analysis.

The computerized management tool was initiated at the request of a GEM hotel client. The software allows tracking of electricity, fuel and water consumption. It allows management to quickly identify abnormalities in their consumption patterns and take the necessary corrective actions. GEM has expanded this tool in "Access" to allow application to any facility with a minimum of adaptation by project staff. Three SGEs have so far been sold for 40,000 Dh each.

The computerized ORE electrical bill analysis is the program used by GEM engineers in the ORE program. The program examines (a) optimal subscribed demand,(b) power factor and (c) on-peak demand. The program is available to consultants free of charge but some reluctance was expressed by project staff when asked if a potential client could obtain the software. The ORE program has an average return of nearly 13 times the fee charged for the service. The service fee per actual person-hour of effort is about 4 times the average engineering salary, potentially making this service a very lucrative one.

8. Development of New Private Sector Firms

This component was also added in the 1992 amendment and called for the establishment of 2 - 4 private sector firms. This deliverable underlines the push for private sector development of EDM/CTPP capabilities. One firm, ADS Maroc, clearly fits into this category. However, a number of private consultants and consulting firms have been trained by the project and could provide EDM services when there is an opportunity. GEM engineers will be leaving the project with EDM/CTPP capabilities, taking their skills to whatever firm or project hires them next.

C. Training

1. U.S. Short Courses and Internships

Three trips to attend short courses were made to the U.S. as part of the project:

(a) July 11-28, 1992, short course for Mustapha Benkhassi, GEM Senior Engineer, to two-week course on sugar processing at the Beet Sugar Development Foundation.

(b) July 1992 short course for Abdelmourhit Lahbabi, GEM Senior Engineer, to MIT courses on Modeling, Simulation and Optimization of Chemical Processes, and Cooling and Refrigeration Systems.

(c) July 1992 "internship" for Said Guemra, GEM senior engineer, to learn hotel energy management techniques from technical directors of major U.S. hotels.

The project has not offered U.S. short course training to the Moroccan private sector because a training consultant in 1992 determined that "costs were deemed to be high, industrial equipment in the US is generally different from what is found in Morocco, key personnel would be absent for too long and there are very few technical personnel who speak English, and less who have the time to learn it." Project documents state that training needs not met by existing in-country workshops would be provided by bringing instructors to Morocco to offer the course.

2. Study Tours

The study tours were intended "to acquaint key Moroccan managers and engineers in the government, the private sector, professional associations, and the educational institutions with recent advances in EDM and familiarize them with U.S. equipment." These seem to differ from the U.S.-based training component in that these are more for awareness of EDM (and, later, CTPP) concepts than technical information. Three study tours of this type were undertaken.

(a) April 13-27, 1993, cement tour of three cement companies, a construction technology research laboratory and the World Environmental Center. Ten managers and engineers from seven cement companies and Abdelmourhit Lahbabi, Technical Director of Projet Gem, participated in the tour.

(b) July 16-28, 1994, networking trip for two ENIM staff members, Director Belcadi and Professor Abdelmourhit Lahbabi. Meetings were held with 3 universities and 2 energy conservation service providers. A cooperative agreement between ENIM and the University of Wisconsin was signed during the trip.

(c) In May 1994, Mohammed Taoufik Adyel, head of the MEM's Studies and Programming Division, and GEM engineer Abdelkrim Benanni visited energy and environmental policy makers and regulatory agencies, EDM/CTPP services providers, and professional associations that deal with EDM/CTPP technologies in the U.S. to organize future study tours.

Two more study tours were planned and logistics prepared but were canceled at the last minute due to several factors, primarily co-financing and scheduling. These were the sugar industry tour and the OFPPT (vocational school) training of trainers.

3. In-Country Intensive Courses

A total of 39 intensive courses in five subject areas attended by 632 persons have been offered in Morocco since project inception. These include:

Course	Workshops	Participants
Energy Management Techniques	13	163
Boiler Operating Efficiency	11	157
Electrical Systems	7	172
Steam Systems	7	126
Natural Resource Management	1	14
	39	632

A summary of the workshops including year of presentation, site, number of participants, and presenters is given in Exhibit 8. Persons interviewed about the workshops unanimously stated that the quality of the workshops was excellent. Typical workshop price was 600 Dh per day in a market where many average-quality seminars cost 3,000 Dh or more per day.

In addition to the above five technical workshops, the project has developed and delivered 19 "à la carte" training seminars for industrial and hotel client sectors. Some seminars were held on-site for a specific client and others were open for a specific sector or for all sectors. Some of the seminars were presented in collaboration with ENIM and Marketis, an Agadir marketing company retained to locate audit clients. Presenters have included GEM project personnel, local consultants trained by the project, ENIM professors, and international experts. A total of 373 persons have attended these seminars to date. A summary is presented in Exhibit 9.

Seminars have included such subjects as how to perform energy audits, conducting cement kiln thermal balances, energy efficiency in industrial installations, energy management for hotels, sugar industry energy balances, alternative fuels for cement factories, and water treatment for boilers and refrigeration systems. The subject and location of many of these has led to a "hands on" component for client technicians and engineers. Training participant targets in both "intensive" and "hand on" areas appear to be far surpassed.

Using a formula developed in-house, GEM estimates that 15,800 t.o.e. are saved annually through increased awareness and knowledge acquired through the training courses.

4. In-Country Hands-On Training

The project reports that it has trained 526 persons by informal hands-on methods. Each facility receives informal training as part of an EDM/CTPP audit and as part of the OREs and ORCs. The extent of this training varies with the interest of the facility and the entity performing the service.

Many of the training workshops cited above have a "hands on" component and some are conducted on-site permitting direct access to the equipment under study.

As an appreciation of the quality of GEM's hands-on training, one technical manager said that the in-plant training provided to his technicians was by itself worth half the price of the audit. Another facility stated that the GEM engineers were so practical that time spent accompanying them on the audit was very beneficial.

5. In-Country Training: ENIM and Other Educational Institutions

GEM staff and ENIM professors developed five courses that are now presented to fifth-year students at ENIM. Initially an energy audit course was presented but its content was absorbed into the other courses. A special energy audit course adapted to the agro-food sector was presented for students of the IAV (the agricultural and veterinary institute). All of these courses were presented in Rabat. A summary of the courses is given in Exhibit 10.

The 1994-1995 Work Plan states that the assistance to ENIM, and the Ecole Mohammedia des Ingenieurs (EMI) has been completed, assistance to the Vocational Training and Employment Promotion Office (Office de la Formation Professionelle et de la Promotion du Travail = OFPPT) is 90 percent complete, and assistance to the Institut Agricole et Vétérinaire (IAV) (the leading tertiary education institution in the field of agro-industry processes) was to be completed during the work plan period. The assistance to ENIM, EMI, and OFPPT has been to strengthen their energy management curricula and includes computer hardware and energy measurement equipment. The remaining OFPPT assistance is to train staff who would work at "a new junior college in Casablanca dedicated to training technicians in thermal applications." The activities planned with IAV "focus on joint seminars for agro-industry covering energy efficiency projects."

6. Management Training

Management training for private sector consultants and project staff who would later on move to the private sector was added in the 1992 amendment. The evaluation team found no further mention of such training in project documentation, nor could GEM or USAID confirm that such training took place.

D. Policy Studies

The project reports that it has prepared three policy analyses to date. This area has been troublesome for the project as there does not appear to have been a clear understanding between USAID and the MEM as to which areas the policy analyses should deal with. The reported policy analyses to date are:

(a) Cogeneration. Completed for the 1993 Symposium on Cogeneration, this study examined the potential for cogeneration in Morocco and identified obstacles to its development.

(b) Transition Plan. This document examines options for project capacity sustainability after the PACD.

(c) Demand Side Management (DSM). A DSM pilot study, which is currently underway, examines the 20 facilities in the Tangier area with the largest demand and the greatest potential for savings. It focuses on integrating DSM into overall national energy policy and will hopefully lead to an action plan outlining a better management of energy resources.

It should be noted that the transition plan was added as a separate line item in the 1992 amendment. Based on information provided by project staff, only two policy analyses can be counted as deliverables in this category. USAID records provided to the evaluation team list several project products that USAID considers as policy studies: energy baseline studies, bioclimatic studies, financing study, supplier study, and a cement strategy study.

Other policy studies recommended earlier in the project but not undertaken include (a) energy conservation in the transportation sector, (b) analysis of factors influencing the purchase of EDM/CTPP technologies by the private sector (which could be one of the uses of the data base), (c) costs and benefits of implementation of a national industrial boiler efficiency program, (d) the potential for reducing electricity demand by switching to natural gas, (e) cogeneration as a support to policy and regulatory reform, and (f) implementation of an investment code relative to energy saving projects, which would document the experience of a project client as it imports energy-saving equipment.

Although the 1988 project paper calls for 5 policy studies, a number that was later increased to 10, the project does not have plans to complete any more at this time.

III. PROJECT IMPACTS

In May 1995, the Checchi and Company evaluation team carried out interviews with plant managers and production engineers of a sample of factories and hotels in Tangier, Kenitra, Temara, Rabat, Casablanca, and Marrakech that were clients of GEM through 1992, in order to get the reaction of clients to GEM's interventions. On the whole, GEM's interventions at the plant level are perceived as effective and cost-saving by the plant managers interviewed by the evaluation team. One manager commented that if he had foreseen the savings resulting from the GEM energy audit, he would have been willing to pay the full cost of the activity without the USAID subsidy.

The consensus is that the GEM's information and awareness campaigns were effective in sensitizing a number of factory managers to the need for energy demand management. As one of our interviewees put it, because of GEM, energy demand management is now a coffee house topic among Moroccan businessmen. GEM's activities became known through newspaper articles and GEM mail-outs. Plant managers and engineers who attended seminars and workshops emerged with new ideas and in some cases followed up their interest by requesting GEM to carry out an energy audit or related study of their operation. The GEM newsletters are read by businessmen and engineers who have not attended seminars but who adopt some of the ideas appearing therein, even if no request is made for a GEM audit. The GEM study tours have been particularly useful for the cement industry production managers who have been able to visit U.S. plants and to see up-to-date U.S. equipment in operation.

One person interviewed gives GEM much credit for having (a) accomplished many good projects in a short period of time, (b) made "energy audit" a commonly used word both in and outside the target sectors, (c) provided simple tools and methods by which engineers can quickly and accurately analyze and quantify energy use and identify means of saving money and (d) trained Moroccan engineers to make practical use of their calculations to focus on the goal of identifying savings rather than applying the more academic Moroccan/French approach of focusing on the detail and presentation of the calculations.

The discussion below follows the outline of the questions posed in Article III (Scope of Work) of the Terms of Reference for the present evaluation (see Annex C).

A. Increased Awareness and Information

1. Effective Actions

Although seminars, publications and mass media are the most commonly thought of means to promote EDM/CTPP awareness, virtually every activity undertaken by the project had a promotional aspect. In every marketing conversation for project services (audit, ORC, ORE) the benefits of EDM/CTPP were mentioned. Likewise, the technical workshops and hands-on training discussed EDM/CTPP benefits. Finally, the fact that GEM cared enough to contact the client to gather implementation data underscores this message to the clients.

From our discussions with GEM clients, it would appear that the most effective of the promotional activities of Projet GEM were the Project's awareness and technical seminars, one or more of which were attended by most of our interlocutors. All of the former participants we talked to expressed a high opinion of the seminars, the only complaint being that the seminar contents were too much the same from year to year. According to the seminar participants, what they appreciated most was that the seminars proposed practical solutions to real problems that the participants faced in their plants.

It is clear, however, that GEM's other informational activities - newspaper articles, mail-outs, the GEM-O-GRAMME, and visits by GEM staff - reached a considerable number of professionals in the target sectors. Some of the ideas launched in the technical seminars and repeated in the GEM-O-GRAMME were picked up and applied by targeted professionals themselves without requesting assistance from GEM, and sometimes without attending seminars.

In the case of the cement industry, which was the most important of GEM's initial target sectors, GEM made direct contact with cement plant managers and production engineers to get their activities started. Since the cement plant managers were already aware of the returns to energy conservation, they were particularly responsive. The cement cells organized by GEM and the industry have further sensitized the cement plant managers to energy conservation as evidenced by their acquisition of new equipment in line with recommendations made by GEM.

Promotional and regional conferences appear to be effective in sensitizing managers to EDM/CTPP matters.

High impact assistance such as OREs may be a way to promote EDM/CTPP because the savings are large and the payback tends to be quick.

The evaluation team had the impression that the data base has not been given sufficient attention at this point in the project and has not been updated annually as called for in the original project paper. However, the Government helped USAID design this activity, negotiated the Project Agreement with USAID (including the 1992 amendment), and helped manage implementation throughout, realizing that its policy benefits were more likely to come near the end of the activity when data were developed and analyzed to indicate the most attractive options open in energy demand management.

The MEM's collaboration and facilitation have been important in bringing some policy elements to fruition.

2. Understanding of the EDM/CTPP Concept

The plant managers and production engineers contacted by the evaluation team in the initial three target sectors were clearly aware of the implications of energy demand management for their profitability. Awareness of the importance of clean technology and pollution prevention was in some instances thrust upon them by pressure from the local community where they were located. A case in point is the experience of the SAFRIPAC paper plant in the industrial zone of Tangier when a broken sewer main spilled colored water from the plant into nearby streets.

We are told by the cement plant managers that the more modern cement plants in Morocco have been using American equipment and applying U.S. and German pollution norms for almost two decades. The ASMENT cement plant in Temara, whose level of visible pollution is remarkably low, is particularly sensitive to the problem since it is located near an urban area and to windward of a seashore resort a few kilometers below the plant. The manager of ASMENT, who is one of three industry representatives on a committee negotiating norms with the Ministry of Environment, pointed out that his plant meets present German norms and is well within present French and Spanish norms; but he has to negotiate reasonable norms and time lags for their implementation on behalf of the older Moroccan cement plants.

Plant managers in the sectors added to the scope of the GEM project after 1992 are also aware of EDM/CTPP.

Information and awareness efforts of promotional seminars and the GEM-o-gram influenced managers' understanding of the EDM/CTPP concept. Several firms receiving assistance from GEM have purchased new equipment to implement energy efficiency measures recommended by GEM, which shows that the concept was grasped. Some of our interviewees indicated that they now look at their processes through EDM/CTPP filters.

Conversations with private sector consultants indicate that understanding of the EDM/CTPP concept depends not so much upon whether the sector is within or outside of the GEM target sectors but (a) what outside forces compel the facility to seek cost cutting measures and (b) how the facility is managed. Export-oriented industries or producers for whom energy makes up a significant portion of final product cost tended to have had a basic knowledge of EDM/CTPP that GEM built upon. Firms in non-competitive industries (sugar, dairy, and olive oil) or whose decision-making is centered in one (overworked by definition) person tend to have less knowledge because other items are more important to them.

The evaluation team concurs with the present COP that the project needed to promote EDM/CTPP widely to obtain as much of the desired impact as possible. Early in the project's life it was believed that the EDM market demand was so great that promotional activities could create a demand the project could not fulfill. Firstly, this assumption was proved untrue as the project ran

into difficulties selling audit services and, secondly, had the project created such a demand the private sector might have moved, with project assistance, to fill it.

GEM has clearly made a major contribution to sensitizing businessmen and production engineers to the benefits of energy conservation although some of them were already aware of those benefits. Most of the EDM/CTPP knowledge in Morocco seems to be traceable to GEM. However, the market is not yet driving businessmen to include EDM/CTPP technologies and techniques as part of their cost-control strategy.

B. Technical Assistance

1. Response to Energy and Environment Audits and Feasibility Studies

All the plant managers and production engineers visited by the evaluation team expressed great enthusiasm concerning the results of the energy and environmental audits that GEM had carried out for them. For a variety of reasons, however, implementation rates vary. For example, some of the hotels are waiting for business to pick up and their finances to improve before undertaking the necessary investments. One of the cement plants is putting off the more important of the projects proposed in the GEM audit until they can be incorporated into the next expansion of the plant. Maroc Lait is shutting down the plant in Casablanca that was audited and is transferring existing equipment to its other plants.

Despite the mid-term evaluation's mention that the project was concerned about creating a market demand that they could not fulfill, the market for audits has not been strong. A marketing firm that contacted every potential client on the chamber of commerce's membership list in one major city got less than 10 audit clients. The cost subsidy for the audit has been reduced since that time, making audits even less attractive.

Once a facility has received an audit, the personnel are usually very enthused over GEM services and EDM/CTPP concepts. Most of our interviewees held the project and project staff in very high esteem.

2. Energy and Environment Audit Recommendations Followed

GEM energy audit reports usually make two sets of recommendations: those requiring no investment in equipment, and those requiring new equipment. Postponement of implementation has been frequent when significant investments are involved.

Among the audit recommendations most frequently implemented are the following:

- Boiler heating optimization (**optimisation chaufferie**)
- Power factor improvement

- Reduction in the electricity bill (**réduction de la redevance électrique**)
- Insulation (**calorifugeage**) of pipes and valves
- Replacement of over-sized motors
- Automatization of process controls
- Recuperation and recycling of raw materials
- Change in type of fuel (e.g. replacement of fuel oil by propane gas)
- Optimization of furnace combustion by improved control of air
- Reduction in heating and/or refrigeration during periods of non-use of facilities
- In the case of cement plants, improved regulation and operation of burners; improvement of ventilators
- Reduction or reuse of waste water.
- Reuse of production materials.

In general, even where energy audit recommendations were not immediately implemented, they were effective in helping managers select higher efficiency equipment when they expanded capacity or purchased new equipment.

GEM's implementation data are the most reliable information available on actual saving of energy and money resulting from GEM proposals that have been implemented. This is not unusual since most facilities do not have the means to sub-meter or quantify energy use and savings. GEM estimates that actual investment and savings figures are typically within 10% of estimated figures. The general impression we got from our interviews is that, for projects actually implemented, investments were somewhat more costly than predicted and savings were somewhat (one guess was 10%) less than predicted. This degree of variation from initial GEM estimates did not present a problem to the plant managers interviewed. (GEM's own research indicates that the investment and savings estimates are almost always conservative, resulting is shorter payback periods than given in the audit report.)

There were cases where the cost of investment was 30 percent higher than initially estimated, which delayed the implementation of the project. GEM's explanation of the additional cost is that the client enterprise usually subcontracts the work instead of having its own technical department carry it out. There was one case where actual investment cost turned out to be more than twice the initial estimate; the project was not undertaken because of the high capital cost and the resulting long payback period.

The results of an implementation analysis undertaken by GEM are summarized in the table below, which shows the number of clients by sector and percentage implementation rates for savings of t.o.e. and Dh compared with initial audit estimates:

Results of GEM Implementation Survey

Sector	Clients (No.)	toe (%)	Dh (%)
Agro-food	8	57	47
Construction Materials	5	58	36
Hotels	16	11	20
Other	4	55	50

Reasons for non-implementation include lack of financing, exclusive concern with plant expansion, organizational changes preventing decision-making, and technical assistance needed. A more detailed analysis is presented in Exhibit 11.

The implementation analysis data as gathered by GEM engineers appear to be generally reliable. In some cases, the GEM recommendations were incorporated by the client when new equipment was selected for plant improvement and expansion. SBS Porcher installed heat recovery equipment on a new continuous kiln and ASMAR incorporated 90 percent of GEM's recommendations into new process equipment. Such cases are not included in GEM's count of projects implemented. In other cases some of the recommendations were implemented after the follow-up contact with the result that those actions are not reflected in GEM implementation data. CIOR has implemented 5 of 7 recommendations, up from 3 at the time of GEM's analysis. The CTPP audits have been so recently performed that implementation data is not yet available. CIOR plans to implement 5 of the 13 recommendations made in the CTPP report. In view of the difficulty of gathering reliable implementation data, GEM engineers are to be commended on their work.

All ORCs can be considered implemented because a boiler tune-up is performed by the consultant. Energy savings can be calculated from the change in efficiency from before and to after the tune-up.

Implementation of OREs depends upon the clients' initiative. Actual implementation data are not available but project engineers concur, on the basis of their professional contacts and informal follow-ups, that over 50 percent of the ORE clients implement 60 to 70 percent of the recommendations.

In an attempt to increase implementation rates, the project involved ADS, a Canadian consulting firm which had CIDA money to subsidize services rendered, and INNOV Projet, a Moroccan partner company of ADS, in project recommendation follow-up. Even with subsidies and GEM's open books, ADS found it difficult to market its services successfully. When CIDA funding stopped, ADS foreign staff left Morocco. INNOV Project, now called ADS Maroc, still follows up former ADS clients and contacts GEM clients to propose implementing audit recommendations. The head of ADS Maroc reports business to be slow.

3. Audits and Project Impact

Project impact has a variety of aspects: money saved; firms affected; engineers and consulting firms trained; sustainability. The GEM project has had a significant impact on Morocco's energy consumption and foreign exchange outlays by its success in working with the cement companies and with other larger energy-consuming industries. However, GEM personnel consider the majority of their clients to fit into the medium-sized facility category. The cement plants, sugar mill, two large textile manufacturers, the international hotel chains and ODEP (Casablanca port) are considered large. The tannery in Fes and locally-owned hotels are considered small. Total potential energy savings from GEM recommendations come to 31,000 t.o.e. and 113 million Dh per year. A breakdown of these totals by category of intervention (audits, ORCs and OREs), plant size, and sector is presented in Table 1. Our estimate of total actual energy savings based on GEM implementation data comes to 16,000 t.o.e. and 41 million Dh per year. A breakdown by sector is presented in Table 2.

GEM attributes savings of water from 35 audits between 1989 and 1993 to 609,250 cubic meters per year, equivalent to the annual consumption of a town of 23,063 inhabitants, or 6.2 million Dh.

Pollution prevention as a result of implemented savings amounts to an estimated 112 tons of SO_2, 160 tons of NO_X, 36,800 tons of CO_2 and 32 tons of dust. A summary table prepared by GEM engineers for project impact at the end of 1993, including estimated project effects on employment and conservation obtained through awareness seminar activity, is given in Exhibit 12.

The average energy audit had a total proposal cost of 96,000 Dh and recommended savings of 2.5 million Dh annually. In the worst case, the recommended savings were 1.9 times audit cost; the best case was 116 times audit cost. ORCs cost the project about 2,500 Dh each for an average savings of 11,000 Dh; 24 of 44 ORCs cost more to perform than the actual estimated savings obtained from the tune-up. GEM estimates annual savings from its ORCs at 3.7 million DH. The average cost of OREs was 6,000 to 7,000 Dh for average recommended savings of 84,000 Dh. GEM estimates 7.4 million Dh in annual savings from its 88 OREs.

The project has not met and does not appear to be able to meet targets set for audit, ORC, and ORE completions. The project chief of party explains that more energy has been spent on promotional activities. The setting of the numerical targets of the deliverables may be in question for the audits

but seems reasonable for the ORCs and OREs. Below is a summary of technical assistance completions by year:

	Audits	ORCs	OREs
1990	6	8	0
1991	4	5	10
1992	8	15	12
1993	17	15	39
1994	5	3	27
	40	46	88

Taking an average of outputs for the highest two years, one may be able to assume a maximum of 60 audits, 90 ORCs and 200 OREs. The deliverables call for 76 audits, 85 ORCs and 120 OREs by PACD. While this method of estimating outputs is open for discussion (for example, it does not take into account project activities that do not recur annually), it does serve as an indication of project potential. If the project were not so close to PACD, it would be worth addressing this issue. As it is, available manpower and resources should be concentrated on the CTPP and DSM technical and promotional components of the project.

The energy audits began with a 75 percent subsidy, which was first reduced to 50 percent and now stands at 25 percent. The idea was to create a market for EDM services by low-cost, high-quality audits whose cost would be increased with time as the market developed. It appears that interest in having audits performed increased at a greater rate than the willingness to pay for them.

The evaluation team holds that this was a novel way of introducing EDM services to Morocco. Additionally, ADS Maroc no longer has access to Canadian financing, putting all consulting firms after the close of the project on the same footing. USAID should be careful in their project planning activities to avoid inadvertently providing free or subsidized services that would hinder the development of the Moroccan private sector. Moreover, USAID should use Moroccan consultants over foreign consultants when qualifications are acceptable because of monetary savings and the local consultants' familiarity with the Moroccan situation.

In order to obtain audit clients, GEM implemented a creative marketing strategy of sharing 10 percent of the audit cost with the marketing firm that sold the audit services. However, even with this approach, the project has indicated that they do not have a backlog of audit clients.

Two engineers interviewed, one in the project and one in the private sector, expressed the view that simple audits of under 10 person-days of total effort (about 25,000 Dh) would sell in Morocco. This simple audit would then be followed up by a detailed analysis of the most promising recommendations. GEM's view is that less exhaustive, and therefore less costly, audits would not help to open up the market, since the credibility of the audits depends on their quality and detail. One engineer saw a barrier in the likelihood that what managers now understand as an audit has been defined at the high level of effort put forth by GEM. He said he would have to find another

name for the service. This concept seems worthy of testing and, indeed, it was the original concept of the EDM project paper! However, it appears that the project's emphasis on quality and magnitude of savings has helped to promote EDM/CTPP in Morocco although it may take some time after the close of the project for industry and hotels to make the adjustment.

At its present level of effort and organization, the project is not sustainable without outside funding. To be sufficient for private sector engineering service providers to make a living, the detail of audit services and turnaround times (without compromising quality) must be reduced; and private sector firms must focus more on marketing to realize potential market demand for EDM/CTPP services. The market does not appear mature enough for a firm to market exclusive EDM/CTPP services, particularly with only passive marketing.

The evaluation team tried to verify the amount of engineering time spent on each audit but discovered that time sheets are not kept in such a way as to permit such a calculation. Several of the engineers reported that the number of estimated person-days upon which the audit proposal cost is based has reflected 40 to 80 percent of the actual person-days spent in site visits, analysis and report development. The latter figure is probably more representative of the project now that the staff has more experience in a wider range of facilities. The two sugar company audits undertaken early in the project reportedly took twice as long to complete as was proposed. The COP continually pushes project engineers to keep to their proposed timetables.

Because clients are already difficult to locate, ostensibly due to the cost of an audit, it may be advisable to reduce the amount of engineering time spent on the audits, to the extent that it can be done without reducing the accuracy and coverage of the audit. One project engineer plans to market audits in the 25,000 Dh range to identify the most promising areas of savings. He would then attempt to market services to specify, bid, and install these recommendations, using savings achieved by projects in one year to help finance additional projects the coming year. Another consultant felt that the upper economic limit for audit services provided to smaller and medium enterprises (SMEs) was 20,000 Dh.

4. Main Beneficiaries

The numbers of main beneficiaries of project assistance are given by size and sector in Table 3. This assistance includes energy and environmental audits, ORCs and OREs. The largest number of clients served were in the medium to large categories. The sectors of agro-food, hotels and textiles received the largest number of technical services. Hotels received the largest number of interventions in the small category. The largest total savings, both recommended and actual, were realized in the building materials (primarily cement) sector. The agro-food sector had the next largest energy savings.

Another beneficiary of the project was the private sector. GEM was to create a market through quality services that were to be subsidized at first with the subsidy decreasing over time. Private consultants and firms were to be trained through project activities. Most of the private sector consultants interviewed expressed the view that they felt they were in unfair competition with GEM

and ADS, both implementing government-sponsored programs. Having established the link between quality and EDM/CTPP services, it is time for GEM and other government program to step back and let the private sector attempt to provide these services. This is particularly appropriate for other pollution prevention programs that USAID is implementing or planning. Project design and implementation should consider how to involve the private sector in reaching project goals. Two suggestions to be made are (a) to hire qualified national consultants for specific tasks instead of contracting foreign experts and (b) to subcontract many project tasks instead of maintaining a large permanent project staff. In the Moroccan case, local skills can be brought up to international standards, when not already at that level, by U.S. and in-country training. A side effect would be to reduce overall USAID costs while meeting project goals and promoting the Moroccan private sector.

The project resulted in $600,000 of U.S. equipment being purchased. The types and value of equipment are given below:

Type of equipment	Value ($)
Boiler tune-up kits (40 kits at $600)	24,000
Cement cell measurement equipment	60,000

5. Demonstration Projects

The demonstration projects appear to have only a minor impact on relieving barriers to implementation of the selected technologies. The main effect of the demonstration projects seemed to be validating the concept of EDM/CTPP. GEM decided not to expend much effort on the implementation of demonstration projects because, as stated in the chief of party's comments to the mid-term evaluation report, "much of Moroccan industry is quite aware of technological options such as cogeneration, condensate recovery, process heat recovery,...It is often the case that if these 'new techniques' have not been applied it is not because they are unknown." The project appears to have actively promoted these demonstrations through publicity and seminars.

Demonstration projects were part of DSM programs in two countries where one of the evaluators worked. In neither case did demonstration projects achieve their intended goal. They took excessive amounts of project time away from other activities that had greater impact. For demonstration projects of the kind envisaged in the project paper, the goals and technologies must be carefully defined.

Nevertheless the list of project demonstration projects that have been carried out and appropriate contacts should be publicized and widely circulated.

6. Relevant Programs Introduced

A number of techniques have been introduced into client plants by GEM activities, among them the application of systematic thermal balances by the cement plants using American equipment purchased with the assistance of GEM, systematic electrical systems analysis including checking of the plant's power factor to reduce energy loss and energy costs, and systematic boiler checks.

Training of Moroccan nationals is the project's largest potential contribution with respect to introduction of American equipment and know-how. However, according to project staff only U.S. manufactured measurement equipment has been imported as a result of the project. This can indicate that (a) the market lacks sufficient demand to make it worth while for vendors to carry inventories of EDM/CTPP equipment, and (b) some EDM/CTPP equipment (insulation, steam traps, lighting controls, etc.) is already available in-country.

7. Other Impacts of Technical Assistance

None of the GEM clients interviewed could put a number on the impact of energy and environment audits, technical and economic feasibility studies, and demonstration projects on competitiveness, investment, and job creation. However, the project has noted that the exporting industries tend to have a higher rate of implementation than others. One company is using savings from increased energy efficiency to help return the company to profit-making status after an energy price increase of 100% put them in the red and will break ground on a new facility producing complementary good this next year. Job creation will accompany any resulting expansion of production.

A project engineer suggested an approximation for job creation based on investment which is used by the Ministry of Industry. For every 100,000 Dh investment, the Ministry estimates one job is created. Using this estimation and basing the calculations on implemented savings, the project to date has created 855 jobs.

C. Moroccan Capacity Created

GEM's training of project engineers and sub-contractors has created (or at least reinforced) Moroccan technical capacity to conduct energy and environment audits and to implement EDM/CTPP techniques. Most of the trained personnel received training by attendance of GEM technical seminars and by assisting on energy audits.

Probably the most important and most easily overlooked group receiving training was the project engineering staff. Project engineers accompanied foreign experts on initial energy audits and, later, on the pilot environmental audits. They received intensive audit training, the first group by contractor US staff and the later hires by project staff, participated in technical workshops, and conducted many of the audits and OREs. Individuals involved in the audit work are listed below. Contractor staff and consultants are given in addition to national engineers for completeness.

Engineer	Organization	No. of audits
Mustapha Benkhassi	GEM	17
Said Guemra	GEM	19
Mourhit Lahbabi	GEM	9
Amal ElMernissi	Private and GEM	9
Lotfi Sehli	GEM	14
Seloua Hajji	GEM	11
Abdessamad Issami	GEM	11
Said Benouni	GEM	5
Yvan Gravel	IDEA	20
Mustapha Ait Bassidi	Exper Energy	7
Ali Acha	Exper Energy	4
Ahmad Baraous	Exper Energy	1
Driss Messaho	Private	4
Ali Hajji	Private	2
Ahmad Zakar	Sigma Tech	2
Abdelhanine Benallou	Sigma Tech	1
Belhaj Soulomi	Sigma Tech	1
Mohamed Bouidida	Private	1
Chaoui Roquai	Private	2

Consulting firms and private consultants trained or retained by the project are given below:

Name	Company	Area of expertise
Abdelmourhit Lahbabi	ADS-Moroc	Audits
Driss Messaho	Private Consultant	Audits, agro-industry
Enrique Casanova	Apave Maghreb	ORC
Mohamed Barbouhi	Sud Clim	ORC, HVAC
Mustapha Ait Bassidi	Exper Energy	Audits
Ali Acha	Exper Energy	Audits
Ali Hajji	Energy Engineering	Audits
Mohamed Khouya	Energy Engineering	Audits
Amal El Mernisi	ECO Energ	Audits
A. Benallou	Sigma Tech	Audits
Ahmed Zakar	Sigma Tech	Audits, database
Said Bounani	Private Consultant	Audits
Mohamed Chaoui	Private Consultant	Audits
Mustapha El Khyari	Techni Controle	ORE
Abdel Latif Berrada	Techni Projet	Cogeneration

Eight industrial boiler tune-ups were done by Apave Maghreb in 1990. Apave Maghreb is a local branch of a French company staffed by a French division chief and Moroccan engineers. It is a full-service consulting engineering company. One engineer is trained to do energy audits. Sud Clim conducted 5 hotel boiler tune-ups in 1991. Sud Clim is an HVAC installation and maintenance services company. They have two technicians who can perform energy audits. Exper Energy did 30 industrial boiler tune-ups, half in 1992 and half in 1993. Exper Energy is a 4-person firm that hires consultants as the job requires. Two of the full-time staff have been trained in audit methodology. Training for all three companies was done by GEM through workshops, by having engineering company personnel accompany GEM staff on audits, and by supervising subcontracts.

Technicontrole implemented the first OREs and presented the first electrical systems workshop. Techni Projet developed the cogeneration policy paper presented at the cogeneration symposium. Sigma Tech prepared training workshops in 1990 and developed the database.

A disappointing aspect of the private sector firms contracted by the project is that few of them made any effort to market the skills that they acquired from the project. This may indicate a dependence of the private sector on government or government-sponsored programs to guarantee them employment. In addition, marketing in Morocco appears to be passive. All the private sector consultants interviewed mentioned that "marketing" is done through established friendships, by word of mouth, or by professional connections. Business just "comes" to them. However, most mentioned that business was poor and that USAID should do something. The concept of calling on potential clients without prior contacts or making technical presentations (e.g., case studies at professional associations for the purpose of marketing seemed to be a strange and, perhaps, counter-cultural concept for them.

How to keep that capacity operational after GEM closes down is a major issue the project now faces. The capability vested in these trained personnel will remain in Morocco. Access to their EDM/CTPP skills will depend upon the type of employment in which they find themselves after PACD. However, it is probably too early for an engineer or a consulting firm trained by GEM to be entirely by providing EDM/CTPP services. The trained personnel should seek employment which allows them to provide EDM/CTPP services when requested but to work on other projects in the interim.

Many of the project's personnel already have potential employment after PACD. These are listed below:

	Field	Planned employment
Mustapha Benkhassi	Mech	Unspecified
Abdelkrim Bennani	Chem	President, Mediterre-Moroc
Said Benouni	Chem	OFPPT professor
Said Guemra	Elec	ENIM professor
Seloua Hajji	Chem	Private sector firm
Abdessamad Issami	Ind	Private sector firm
Amal ElMernissi	Elec	ENIM professor
Lotfi Sehli	Elec	Private sector firm

Before closing down, the GEM project emphasize establishing follow-up structures similar to the cement cell in other sectors. For example, GEM could try to convince the hotel industry association to establish a technical subcommittee of plant engineers, a group that is already sensitized to EDM/CTPP matters. The tannery cell formation should also be given high priority.

There remains the question of how to make GEM's equipment available to potential users after the PACD, since USAID is obliged to turn over such equipment to the Ministry of Energy and Mining which has no mechanism for getting the equipment into private sector use. USAID and MEM should explore methods for assuring that private and public sectors can use project equipment after the PACD. Possible recipients include the Ecole Nationale des Industries Minières (ENIM) and the Moroccan Energy Management Association (AMGE).

Should the equipment not be available to the private sector, some consultants may opt to purchase their own measurement equipment. Other consultants have indicated that they do not use GEM equipment, preferring to borrow from friends or a university, or asking the client to purchase the equipment. Some of the consultants now use GEM equipment, some have other sources such as the university and other companies. The minimum amount of equipment a consultant needs costs about $5,000; to be fully equipped, the cost is about $25,000.

Providing employment for the GEM engineers and keeping at least some of them together as an EDM/CTPP team is a goal of the GEM Chief of Party. Part or most of the GEM team could be given the opportunity to be hired into the follow-on Water Resources Sustainability (WRS) Activity. The follow-on project will need to evaluate its personnel needs and determine if job descriptions warrant inclusion of 1-2 years of EDM/CTPP experience. The evaluation team believes that because of the similar scopes of the two projects and the resources invested in the GEM engineers that this suggestion is in the best interest of USAID from the standpoints of cost and quality.

EDM/CTPP technical capacity has been created within the GEM project and among project subcontractors. At least one person interviewed is considering starting a consulting business of his own which may include EDM/CTPP services.

D. Policy Studies

The Ministry of Energy and Mining (MEM) is a focal point in the Government of Morocco for the formulation of national energy policy. Given that 93% of Morocco's energy needs are met with imports of crude oil, refined products, and coal, the twin goals of energy policy for the MEM are (a) satisfaction of the country's energy needs under the best conditions of competitivity and security and (b) promotion of access to energy by all classes of the population, particularly in rural areas. The MEM defines its energy strategy along the following lines: (a) restructuring and institutional development of the energy sector, and optimization of conditions of supply and production; (b) progressive mobilization of local energy resources; (c) diversification of energy products consumed and of market sources of supply; (d) maximization of energy efficiency and control; and (e) promotion of access to conventional forms of energy in rural areas.

The most important energy policy measure implemented by the GOM has been to over-price energy to consumers, which should have made industrial consumers painfully aware of the financial returns to reducing their use of energy. However, the OREs reveal that many managers simply pay their electric bill as if there were no way to reduce costs. This may be due to a perception that when one buys from a monopoly there is only one price and one must pay it. On the other hand, the evaluation team ran across one nice example confirming that energy/raw material conservation can be implemented in Morocco in response to increases in energy prices: SBS Porcher reacted to a sharp increase in the price of LAG by immediately installing heat recovery equipment they had already purchased but had not got around to using.

Data limitations, timing, and funding prevented previous policy efforts from coming to fruition, but based on the most appropriate use of resources and time, the GOM and USAID have agreed to place the accent on demand side management (DSM). The project has heretofore had little direct impact on policy formation and implementation by the MEM, but DSM shows potential for altering this.

GEM's foray into the policy area through the Tangier DSM study will probably be appreciated by the Office National d'Electricité (ONE) and the electric power and water distribution companies (Régies Autonomes de Distribution d'Electricité et d'Eau) which are directly implicated in electricity production and distribution. By reducing peak load demand and eventually integrating private sector generating capacity into the Régie grid, EDM and DSM help reduce the pressure on the ONE to increase capacity.

The material prepared by GEM for the ENIM curriculum should have a positive impact on national policy in the future as ENIM graduates move into jobs in MEM and elsewhere.

E. Private Sector Market for EDM/CTPP Services

The project has successfully established that a need exists in Morocco for EDM/CTPP services. The key seems to be promoting these services as a way to reduce costs or to package them as one tool among many to promote an inclusive concept such as total quality management or resource management. However, several things work against the viability of a market to satisfy this need:

(a) The private sector is willing to pay for advice that comes with hardware but is usually reluctant to pay for advice without hardware. That leads to an unnecessary dependence on turn-key contracts, which could be avoided if a consulting engineer were consulted beforehand. Initial capital costs get more attention than rates of return

(b) Smaller companies have a hard time collecting on outstanding bills; collecting is an art that combines patience, determination, and coaxing. However, the engineering consultants interviewed by the evaluation team report that they are always paid eventually (with a maximum delay of 6 months) but face cash flow problems in the meanwhile. Judicial reform and enforcement may alleviate this barrier.

(c) The private sector doubts that national consultants can fulfill claims that they make, that they can perform competently, and that they can work without conflicts of interest. A more recent development is that even foreign consultants are creating this image for themselves.

(d) The private sector fears that any national allowed into a facility may reveal trade secrets to competitors.

(e) The private sector has traditionally been risk-adverse and has waited for the government to take initiatives.

(f) Implicit or explicit market sharing in a still relatively non-competitive economy leads to a situation where an enterprise that increases its energy efficiency or pollution prevention will reduce costs but not get a greater share in the Moroccan market so there may be little reward in terms of increased sales for businesses that do implement the EDM/CTPP recommendations. Exporting firms, which have to compete internationally, seem to be more sensitive than others to the gains from cost reduction.

Factors a, c and d can be overcome with time if the firm or consultant shows consistently high-quality work and significant benefits to the client. Factors e and f will change with greater market openness and competition, two of the hoped-for outcomes of the privatization process. The evaluation team feels that the market for EDM/CTPP services will expand markedly in the next several years. Firms that have established client networks and offer EDM/CTPP services will have much to gain.

Both ADS of Canada and RCG/Hagler, Bailly of the USA have looked at the market and concluded that there is not enough market demand for a firm that focuses exclusively on EDM/CTPP to survive. ADS was in Morocco for two years attempting to develop a market with the financial assistance of CIDA and the marketing assistance of Projet GEM but they concluded that the market was not yet mature.

Nevertheless, the market should mature with time as industry is further privatized and competition increases. Increased government regulation of energy use and of pollution may speed up market maturity but it may also contribute to the circumvention of the tightened regulations.

Mediterre provides some hope for sustainability since the enterprise may have deep enough pockets to weather cash flow problems. Mediterre will expand by one position for an engineer by the end of 1995 which could be filled by a GEM engineer depending on project needs.

F. Training (U.S. and In-Country)

Views on the impact of training vary but all agree upon its high quality. One technical manager mentioned during an interview that the an in-plant seminar was worth half the cost of the audit, especially with respect to sensitizing personnel to savings associated with EDM. Another plant manager interviewed was of the opinion that the seminars remain too much the same each year and that too little new is added to them.

The engineers trained by GEM form the core of an energy-related service sector, which is already being used by the cement sector and may be used by more of the hotels once their financial situation improves. Setting up the energy engineers as viable businesses is much more difficult and requires more of the entrepreneurial spirit as seen in the former project staff member who established ADS Maroc as an engineering consulting firm. So far, therefore, training under the project has not resulted in the creation of any other new businesses.

On the other hand, the expertise developed by the Moroccan engineers who have worked with GEM now exists and will be available when called upon, wherever the individuals are working. Existing engineering service firms are likely to extend their activities to include energy-related or environment-related services to the GOM and Moroccan private enterprise as a viable market opens up.

G. Other Issues

1. Pairing Clean Technology and Energy Conservation

When viewed as means to end and not an end in themselves, clean technology and energy conservation seem to be very complementary services. Both examine how costs can be controlled. The driving factors behind them may vary somewhat as clean technologies have historically been driven by regulatory bodies (legislation which when not heeded leads to financial disincentives) and energy conservation by market forces (energy price increases, seeking production cost reductions) although economic reasons for reducing process inputs and energy efficiency standards result in an overlap between the factors.

Promotion of clean technologies and delivery of services match nicely with the structure of the project. The clients for EDM and CTPP overlap, allowing use of the same newsletter and the same regional conferences to promote the concepts and project services. During the audit, project

engineers now look not only at how energy is used in the facility but at how all process inputs are used.

The project has had a very strong response from clients regarding the CTPP component. It is yet too early to judge how effective the CTPP component will be with regards to implementation. Additionally, the impact of charging for CTPP services on the demand for these services has yet to be determined.

An example of the effectiveness of pairing EDM and clean technology is the experience of the SAFRIPAC paper plant in Tangier where both energy conservation and pollution prevention proposals of the GEM audit were implemented. Indeed, SAFRIPAC requested environmental assistance from the project three years before the CTPP component was added. CIOR (cement), Assamak (canning), and COTEF (textile) had environmental audits performed after very positive experiences with a GEM energy audit. All interviewees with whom we spoke regarding environmental services spoke very positively about them and considered the intervention very timely and useful.

2. Environmental Impact of Energy Conservation

The project has had significant impact on reducing environmental pollution by implementation of energy conservation measures. The project focused on the cement industry in order to realize large gains in energy savings and foreign exchange for the country of Morocco. Reduced emissions attributable to the project include an estimated 112 tons of SO_2, 160 tons of NO_X, 36,800 tons of CO_2 and 32 tons of dust. These figures are annual figures for the current rate of implementation. A summary table prepared by GEM engineers for project impact at the end of 1993 showing estimated project effects obtained through awareness seminar activity is given in Exhibit 12.

So far, the overall environmental impact of the CTPP component in terms of saving natural resources has been limited, since the introduction of CTPP technologies and services is recent. One of the more significant efforts to introduce clean technology has been made in the cement industry, but cement industry pollution reduction in Morocco pre-dates the USAID project.

3. Project Innovations

GEM deserves credit for a number of innovations in the quest for finding clients, promoting EDM technologies and services, increasing EDM awareness, and overcoming barriers to implementation. To market services GEM promised a marketing firms and individuals a "finder's fee" of 10 percent of the cost of the audit for each audit successfully sold. The evaluators are not aware of another EDM project with such an approach.

In order to increase EDM awareness, GEM took the seminars and workshops to the clients instead of having them come to Rabat. While this seems to be obvious, the pattern in Morocco and other places seems to be too often to wait for the client to come to the project. A live radio interview which also interviewed project clients live and unrehearsed as well as an hour-long Arabic

presentation on the TV show, Ecologia, were innovative efforts outside the required level of effort that deserve recognition.

In an attempt to increase implementation rates and to establish an private-sector market, GEM opened its books to ADS, an energy services firm working with Canadian funding, and promoted 3rd-party financing for project implementation. In the end, ADS withdrew its foreign professionals from the country due to an undeveloped market for its services. Third-party financing never got off the ground because the firms that would have received the EDM/CTPP equipment did not have sufficient confidence in the concept for their perceived level of risk.

IV. SUSTAINABILITY

Sustainability of energy demand management services after the close of the USAID project requires, on the supply side, trained engineers - who are now available; but it also requires a commercial demand for energy audits and techno-economic feasibility studies that does not yet appear strong enough to support a private sector engineering service sector exclusively concerned with energy demand management.

On the demand side, the hotel industry in Morocco was in financial difficulties during and after the Gulf War and is only this tourist season beginning to recover. The hotels, one of GEM's initial target sectors, have therefore lacked the cash to undertake energy saving investments. In other sectors, except for cement, energy conservation is not perceived as a good return on investment.

On the cost side, the GEM energy audits look expensive, even with the USAID subsidy, to potential clients who are not convinced in advance that the audit will eventually save them money. Potential clients are therefore reluctant to undertake energy audits even when subsidized. The demand for GEM's electrical system analyses has been demonstrably more buoyant than for energy audits, but they are still considered expensive. Unless private sector energy engineering consultants can substantially reduce the costs of their services below those of GEM, they will have even more difficulty than GEM in finding a market for their services. There is unlikely to be sufficient demand to support small engineering consulting firms that limit their activities exclusively to EDM/CTPP concerns. At best, the energy expertise acquired through association with GEM will be sustainable if it is incorporated into broader scope engineering consulting firms that provide energy management services as only one element of their activities.

Private sector engineering consultants face a cash-flow problem that is difficult to resolve. GEM's experience is that many of its clients are in arrears in payment of their bills for the work done by GEM; GEM now insists on 50% prepayment before undertaking an audit. The private sector contractors do eventually get paid but a small private sector engineering firm without financial reserves trying to take the place of GEM in the market that GEM has stimulated cannot survive serious delays in payment for work done.

It seems to the evaluation team that the time spent on GEM audits, and therefore their cost, could be reduced in many cases without reducing their quality. The hotel audits are a case in point. The GEM engineers have by now had enough experience with identifying the key factors for reducing a hotel's energy consumption to be able to carry out audits more quickly; they should be high enough up on their learning curve to be able to reduce the cost of individual audits. Another

possibility that may be feasible is to take a lighter approach to initial audits, identifying the most obvious places to conserve energy, and keeping the audit cost under 20,000 Dh. At that price, initial energy audits would probably be easier to sell, and the results might well convince clients to contract follow up consultancies.

Private sector Moroccan engineers have also to overcome the general bias that nationals are less competent than foreign engineers as well as clients' lack of confidence in the ability of Moroccan consultants to keep company data confidential, to keep trade secrets.

In that relatively unfavorable context, there are nevertheless a number of possible options for sustaining EDM expertise in Morocco after the GEM project closes down:

(a) One option is to follow up a suggestion of the GEM chief of party to try to place some of GEM's engineers in a big local engineering and services firm with the financial stature to bridge periods of interrupted cash flow, and willing to establish an energy conservation and CTPP division that would provide energy audits and other services for which GEM engineers have been trained.

(b) Another option is to canvass existing engineering firms willing to employ GEM-trained engineers to do whatever they are asked to do, including energy and CTPP studies.

(c) Another option is to encourage existing and future sector cells (e.g. the cement cell) to form professional/ business associations that would:

- continue to discuss ideas, aided by experts brought in by USAID under a training program;
- purchase equipment through dues, for leasing to members and others;
- work out an arrangement with the MEM to turn over existing project equipment to the associations for leasing to engineers carrying out energy audits and feasibility studies.

(d) The successor USAID project on Water Resources Sustainability Activity (WRS) might be able to direct some of its sub-contracting to smaller firms that have already retained engineers trained by GEM or will do so once the present EDM project ends. One of GEM's engineers has already set up his own firm (now ADS Maroc) to look for local business. Two other firms that have engaged project engineers are Exper Energy and Sud Clim. The engineering firms in question will have to look out for other business in addition to energy studies if they are to survive, but the skills of the engineers trained by GEM will still be available when a commercial demand for energy studies materializes. The inclusion of demand side management (DSM) in the project may contribute to sustainability of the kinds of activities carried out by the

GEM project. DSM is of keen interest to the ONE and the World Bank, which could lead to demand for the skills acquired by GEM project engineers and consultants.

A problem that needs to be resolved is how to get private engineering firms access to GEM's equipment already in Morocco and soon to be turned over to the Ministry of Energy and Mining. Since the MEM does not have an organizational unit in its structure that can carry out a leasing function, an alternative approach might be to have the MEM transfer appropriate equipment to the professional associations or to ENIM for sub-leasing to members (or other engineers). Either way, there is a major administrative problem to be solved.

Creation of industry cells looks like a good way to institutionalize sustainability. Industry cells can promote EDM/CTPP technologies and services as well as serve as a resource for the formulation and negotiation of regulatory policy.

The thermal balance activity of the cement industry cell is the clearest example of a GEM-sponsored activity that will carry on under its own momentum. Already in 1994, according to GEM's 4th Quarter 1994 Progress Report, the cement cell carried out two cement plant audits with their own staff working with a GEM engineer. Cement is to some extent a special case in Morocco because domestic competition in the cement industry is not overly intense and production managers are a close-knit group of graduates of one or another Ecole des Mines, who face the same problems and talk the same technical language. The specific problem in this instance was reducing kiln energy consumption. The cement cell was established by production engineers from five of Morocco's cement factories as an outcome of discussions with GEM. Indeed, without GEM's initiative, the cell would not have come into being. Although there may have been some initial concern over competition and some distrust over who would control common working funds, such fears were quickly overcome when the engineers worked together as a team on the common task of the first audit (in Meknes).

The nascent tannery cell in Fes also has special factors influencing its formation. Fes is the spiritual capital of Morocco, its river is considered dead, the local authorities are looking for ways to improve the environment, 70% of Morocco's tanneries are situated there, and the European Community and the Swedes have expressed interest in aid to the area. GEM proposes selecting engineers from a representative grouping of tanneries (large, medium and small), training them by taking them on audits, and performing demonstration projects with them.

There has been no interchange of information among the hotels that have commissioned GEM energy audits. Although a Hotel Industry Association exists in Morocco, it is not concerned with technical matters. If the hotel association established a sub-committee for technical matters, that could serve as the framework for interchange of technical information and for continuing the focus on energy saving. GEM might make such a suggestion to the project's contacts in the hotel industry.

Other industries whose circumstances are conducive to forming cells include canning and other agro-industries that export, paper, textiles, and petrochemicals. Driving factors include international

standards for pollution (if the company cannot meet these standards, certain Economic Community members will not allow importation of their products) and quality standards.

V. LESSONS LEARNED AND RECOMMENDATIONS

One of the first lessons learned from the EDM/CTPP project is that innovative approaches for implementation through private sector entities can be effective in Morocco. GEM's dealings with private sector clients and sub-contractors bear that out.

GEM's promotional activities such as awareness seminars and the publicity given to the project's successful interventions through the media (press and television) and the GEM-O-GRAMME newsletter, were effective in making energy conservation a familiar concept to Moroccan businessmen. The same approach should be incorporated into USAID's follow-on WRS Activity. A CTPP/WRS newsletter similar to the GEM-O-GRAMME should be funded by the future project.

With hindsight and what we know now of the dynamics and the actual experience of the EDM/CTPP project, we suggest that it would have been useful to specify from the beginning the extent to which the twin goals of saving foreign exchange and increasing productivity by improving efficiency of energy use were short term or medium term goals. The distinction is relevant for the internal balance of the project in respect of the importance given to factory interventions as opposed to promotional activities. Audits did have an immediate impact on energy consumption in the short term, but their coverage was necessarily limited (although their secondary impact may have been of considerable importance precisely as a promotional tool). The consciousness raising among businessmen achieved by the wide coverage of GEM's promotional activities may well have a greater impact in the medium term. From that point of view, any controversy over the number of audits and feasibility studies actually carried out over the life of project is a bit futile.

It is possible that less intensive and therefore less expensive audits might have been preferable to the detailed audits carried out by GEM. Several of our interlocutors expressed the view that if audits had been less exhaustive and therefore less expensive they would have been easier to sell initially and the market for them would now be bigger, both for follow-up audits and among potential new customers. Managers might be willing to risk 10,000-20,000 Dh for an audit on the possibility of getting an interesting return; they are reluctant to go above that ceiling without careful consideration. Furthermore, it should have been feasible to reduce audit times even for more exhaustive audits after the first set carried out in each sector, since the experience gained by GEM staff engineers and subcontractors should have moved them along their learning curve. Keeping down the unsubsidized cost of project interventions for which the private sector is supposed to pay is another theme that should be incorporated into any follow-on project.

In view of the short time available to the GEM project even if the LOP is extended without additional funding, priorities should be set for the activities to be carried out before the revised LOP. The number of audits called for in the last contract amendment should be reduced and efforts focused on other activities.

Before closing down, the GEM project should try to get follow-up structures similar to the cement cell established in other sectors. For example, GEM could try to convince the hotel industry

could extend from renting the hall and providing lunch, to providing outside speakers, to coordinating field trips to firms that are pace setters in implementing EDM/CTPP technologies. USAID's Training for Development project has expressed interest in supporting chambers of commerce, professional organizations, and private firms that undertake such activities.

(e) Efforts to promote awareness of potential savings from EDM/CTPP services and technologies should be given high priority by the project in the remaining project period. Additionally, a list of consultants with areas of expertise, contact numbers, and previous project work should be widely distributed. Perhaps GEM should throw a "going out of business" party for all their clients and contacts as a first step in trying to organize the coordinating group (**cellule de continuité**) mentioned above.

Table 1. Potential Energy Savings from GEM Recommendations (Cost savings given in 1,000's of Dirham)

Category and sector	Small		Medium		Large		Total	
	Toe	Dh	Toe	Dh	Toe	Dh	Toe	Dh
A. Energy audits								
Agro-food	-	-	1,900	4,700	3,600	7,100	5,400	12,000
Building materials	-	-	460	1,200	18,000	72,000	19,000	73,000
Hotels	1,300	4,800	700	2,400	-	-	2,000	7,200
Paper	-	-	150	820	-	-	150	820
Textiles	-	-	-	-	2,600	6,900	2,600	6,900
Other	-	-	-	-	200	780	200	780
B. ORCs (boiler tune-ups)								
Agro-food	1	3	18	33	1,200	2,400	1,200	2,500
Building materials	-	-	-	-	-	-	-	0
Hotels	27	110	4	17	-	-	31	130
Paper	37	77	37	79	45	94	120	250
Textiles	-	-	34	71	190	400	130	470
Other	3	6	-	-	210	440	220	450
C. OREs (electrical systems analyses)								
Agro-food	-	-	-	1,000	-	-	-	1,000
Building materials	-	-	-	180	-	320	-	500
Hotels	-	-	-	1,800	-	-	-	1,800
Paper	-	-	-	120	-	-	-	120
Textiles	-	220	-	430	-	1,800	-	2,500
Other	-	13	-	33	-	2,200	-	2,200
D. Totals								
Agro-food	1	3	1,900	5,700	4,700	9,500	6,600	15,000
Building materials	-	-	460	1,300	18,000	72,000	19,000	74,000
Hotels	1,300	4,900	700	4,300	-	-	2,000	9,200
Paper	37	77	190	1,000	45	94	270	1,200
Textiles	-	220	34	440	2,700	9,100	2,800	9,800
Other	3	19	-	33	4	3,400	420	3,500
Grand total	1,300	5,200	3,300	13,000	26,000	94,000	31,000	113,000

Note to Tables i and 2: All values rounded to two significant digits; totals may not necessarily add.

Table 2. Estimated Actual Energy Savings from GEM Recommendations (Cost savings given in 1,000's of Dirham)

Category and sector	Small		Medium		Large		Total	
	Toe	Dh	Toe	Dh	Toe	Dh	Toe	Dh
A. Energy audits								
Agro-food	-	-	1,100	2,200	2,000	3,300	3,100	5,500
Building materials	-	-	270	410	11,000	26,000	11,000	26,000
Hotels	140	980	77	490	-	-	220	1,500
Paper	-	-	84	410	-	-	84	410
Textiles	-	-	-	-	1,400	3,400	1,400	3,400
Other	-	-	-	-	110	390	110	390
B. ORCs (boiler tune-ups)								
Agro-food	0	0	2	4.2	145	302	148	310
Building materials	-	-	-	-	-	-	-	0
Hotels	3	14	-	2.1	-	-	4	16
Paper	5	9.6	5	10	6	12	15	31
Textiles	-	-	4	9	24	49	28	58
Other	-	0.7	-	-	27	56	27	56
C. OREs (electrical systems analyses)								
Agro-food	-	-	-	400	-	-	-	400
Building materials	-	-	-	72	-	120	-	200
Hotels	-	-	-	720	-	-	-	720
Paper	-	-	-	46	-	-	-	46
Textiles	-	87	-	170	-	710	-	960
Other	-	5	-	13	-	850	-	870
D. Totals								
Agro-food	0	0	1,100	2,600	2,200	3,600	3,200	6,200
Building materials	-	-	270	480	11,000	26,000	11,000	26,000
Hotels	140	1,000	77	1,200	-	-	220	2,200
Paper	5	9.6	89	460	6	12	99	480
Textiles	-	87	4	180	1,400	4,200	1,400	4,500
Other	-	5.8	-	13	140	1,300	140	1,300
Grand Total	150	1,100	1,500	5,000	14,000	35,000	16,000	41,000

Table 3. Beneficiaries of GEM Interventions

Category and Sector	Small	Medium	Large	Total
A. Energy audits				
Agro-food	-	11	2	13
Building materials	-	1	4	5
Hotels	11	5	1	17
Paper	-	3	-	3
Textiles	-	2	2	4
Other	1	-	1	2
B. ORCs (boiler tune-ups)				
Agro-food	2	6	10	18
Building materials	-	-	-	-
Hotels	4	1	-	5
Paper	1	3	1	5
Textiles	-	6	8	14
Other	1	-	3	4
C. OREs (electrical systems analyses)				
Agro-food	-	18	-	18
Building materials	-	3	4	7
Hotels	-	22	-	22
Paper	1	2	-	3
Textile	2	5	15	22
Other	1	3	12	9
D. Totals				
Agro-food	2	35	12	49
Building materials	-	4	8	12
Hotels	15	28	1	44
Paper	2	8	1	11
Textiles	2	13	25	40
Other	3	3	16	22
Grand Total	24	91	63	178

ANNEXES

Annex A

PERSONS CONTACTED

PERSONS CONTACTED

USAID/Rabat
tel 221-7-762265

Michael Farbman, Mission Director
James Hradsky, Deputy Mission Director
Alan Hurdus, Program Officer
Michael Kerst, Program Officer
Kamal Sebti, Economic Specialist

RCG/Hagler Bailly Inc.
Projet GEM, Rabat
tel 221-7-755647
fax 221-7-759558

Gilbert Richard
Mustapha Benkhassi
Said Guemra
Amal ElMernissi
Lotfi Sehli
Abdessamad Issami
Said Benouni
Yvan Gravel
Abdelkrim Bennani
David Burns

Ministry of Energy and Mining, Rabat

Moh. Taoufik Adyel, Division Etudes et Programmation,
tel 221-7-

Atlas Bottling (Coca Cola), Tangier
tel 221-9-935143

Nahi Yusef

SAFRIPAC (paper)
Usine: Zone Industrielle Route de Tetouan
BP 400, Tangier
tel 221-9-950692/3, 940872
fax 221-9-944144

Mohsin Sefrioui, Directeur Général
Ajbar Abderrazak, Responsable Technique

Industrielle des Fibres, Tangier
tel 934216/7

Didouh Benessa, Technical Director

Nascotex, Tangier
tel 350023/35007

Cititex, Tangier
tel 351203/350204

Ceramica de Tangier
tel 971567

Mestali Mohamed, Chef de Production

Hotel les Idrissides, Marrakech
tel 04/448777

Cimenterie ASMENT, Temara
tel 07/775665

Mr. Ahmouz, Technical Director

ADS Maroc, Rabat
tel 07/755341/42

Abdelmourhit Lahbabi
Directeur General

Exper Energy, Rabat
tel 07/

Mustapha Ait Bassidi

Institut Agronomique et Veterinaire Hassan II, Rabat
tel 07/777443

Driss Messaho
Professeur

Sheraton Casablanca
tel 02/317878

Balghi El Hassane
Directeur Technique

SBS Porcher
tel 07/ 372207/08/09

Red Slaoui
Ingenieur Ceramiste

Co-Lait, Kenitra
tel 07/378619

Serroukh Ahmad

Maroc Lait, Casablanca
tel 02/401255

??, Production Engineer

Cementerie ASMAR, Marrakech
tel 04/434263

Mr. El Kouch
Production Manager

Cimenterie Cior, Oujda
tel 06/693240 Oujda
07/670787 Rabat

Y. Ennadifi, Administrateur Directeur General
Mr. Filali, Plant Manager
Mr. Chebli, Technical Director

Cimenterie CINOUCA, Casablanca
tel 02/401342

Mr. Karim, Plant Manager

Hotel Agdal, Marrakech
tel 04/437099

Mr. ??, Assistant to the Director

COTEF, Fes
tel 05/641309

Mr. Guerraoui

Sahara Tours Hotel Chain, Agadir
tel 08/845543
08/840073

Hotel Igoudar, Agadir
Hotel Agador/Tamlelt, Agadir
Hotel Tagadirt, Agadir
Blanchisserie Sahara, Agadir

Mr. Soussi
Mr. Goua Goua

SOFT, Casablanca
tel 02/352060

Mr. AbouTarik
Directeur General

Sud Clim, Marrakech
GEM ORC Contractor
tel 04/433919
04/433627

Mohamed Barbouhi
Owner

Techni Controle, Casablanca
GEM ORE Contractor
tel 02/303114/29

Mustapha El Khyari
General Manager

Training for Development, Casablanca
tel 02/984325/26

Peg Clement
Assistant to the Director

Chambre de Commerce et Industrie, Tangier
tel 09/932535/935771

Mohamed Serifi Villar
Directeur

Annex B

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DOCUMENTS REVIEWED

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Annex C

PROJECT LOGICAL FRAMEWORK (from Project Paper)

Annex C

ENERGY DEMAND MANAGEMENT 608-0193

PROJECT LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	Means of Verification	Important Assumptions
Program or Sector Goal:	**Measures of Goal Achievement:**		
Save foreign exchange & increase productivity by reducing energy waste and by improving efficiency of energy use.	- Energy savings of 5-10% in target sectors (60,000 toe saved). - Improved energy intensity index in target sectors (5% from 1988 base).	World Bank figures Oil price indicators Industry records	- Energy prices do not drop below $12 per barrel. - GON maintains positive growth policies.
Project Purpose	**End of Project Status**		
To develop and implement the core of a national energy demand management program.	- National energy demand management program in place. - Total EDM investments reach $20 million. - GON policy to encourage EDM in place.	Independent review Investment records	- GON is willing and able to provide adequate incentives. - That sufficient demand for energy audits and investments can be generated to support private energy auditing and engineering business. - Pay back period on EDM investments reasonable and acceptable. - Technology available and transferable.
Outputs:	**Magnitude of Outputs:**		
Information and Awareness of Energy Demand Management concepts and techniques.	- 3 information packages (by sector) - Technical Publication (10 issues) - 45 seminars and workshops - Annual energy consumption survey (5) - 3 Information Centers established - International Exchanges (25 invitees) - Energy Manager Assn. established	Public record	GON decides internal coordination of policies is important and practicable.
Technical support and tech transfer to identify firm specific EDM actions and applications.	- 40 Energy Audits performed - 45 Feasibility studies - 15 Technical applications	Company (sector) records On-site monitoring	Users amenable to audits, demonstration projects, and special projects. Auditing and engineering skills provide sufficient payoff.
Training on energy managers, energy auditors, engineers, technicians, students, and faculty.	- Curriculum upgraded at EMIN - 60 p/m U.S. short courses and internships (30 participants). - 62 p/m in-country EDM (150 parts) - 120 p/m in-country 'hands on' (400 parts).	Financial records	
Policy analysis and advice to GON on EDM issues.	- 4 studies completed		
Inputs:	**Implementation Target:**		
USG $5.0m (ESF grant)	- Technical Assistance, Training, Audits, Studies, Commodities, Engineering, Technology transfer	Project agreement	Approval of project by GON/AID. Appropriate TA and training available.
GON $ .8m Private Sector $ 2.2m Total $ 8.0m	- Counterparts, Facilities, Airfares, Equipment	Contracts	

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Annex D

EVALUATION PLAN (from Project Paper)

VI. EVALUATION PLAN

As a pioneering effort to promote efficient energy use throughout the Moroccan economy, the EDM program will be of interest and value to a broad audience within the GOM and USAID, and among other donors and AID-assisted countries. It is important, therefore, that the project receive careful evaluation both during and after its lifetime. There will be two formal evaluations of the EDM program: a mid-point evaluation to be completed in 1991 (2nd Quarter) and a final evaluation to be completed at the end of the project. These evaluations will be based upon both quantitative and qualitative measures.

The quantitative objective of the project itself is to save at least 60,000 toe annually by the end of the project. These objectives are to be achieved through the transfer and demonstration of EDM technologies, especially from the United States, information and awareness activities, training, technical support, and studies and policy initiatives. The project must be evaluated from two points of view: 1) whether the types and numbers of planned project activities are being carried out, and 2) whether these activities have achieved the desired results (i.e., are project activities saving energy). One of the critical benchmarks against which to measure the success of the project will be an energy intensity index established for each of the target sectors. These will be established by the consulting energy engineers and used as a basis against which to measure project activities.

Evaluation Framework and Data Collection Plan:

1. The Users of the Information

The primary users of the information will be the technical assistance contractor, the project Steering Committee, participating Moroccan associations, and USAID.

2. Project Goals, Purpose, and Outputs

The goal of the Energy Demand Management Project is to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco. The project purpose is to develop and implement the core of a national energy demand management program (EDM).

Activities directed at these sectors will include information and awareness campaigns (e.g. seminars, workshops, newsletters, study tours) to educate key sector personnel about energy demand management concepts; firm-specific audits, techno-feasibility studies, and demonstration projects to lay out energy-efficient strategies in cooperation with participating firm owners and to illustrate energy savings through the installation of equipment and management aids; and U.S. and in-country training of plant managers, energy auditors, and engineers to improve technical standards and enhance individual capabilities in dealing with energy management issues and concepts. The project will also include special studies designed to influence policy decisions and raise the overall level of understanding on such issues as taxation on EDM equipment, and standards.

3. Managers' Questions Related to Project Goals, Purposes, and Outputs

The following questions will be investigated during the life of the project to determine: (a) whether project purpose and goal are being achieved and (b)

Source: Project Paper, Morocco Energy Demand Management (608-0193), July 22, 1988.

whether the project is being implemented as planned and outputs are contributing to purpose and goal achievement.

Goal-Level Questions

- Has the project directly resulted in energy savings and deferred energy sector investments?
- Has EDM been diffused from target firms to other firms? What has been the spread effect of the project?

Purpose Level Questions

- Has the core of a national EDM Program been established?
- Has an institutional capability been established within Morocco, especially in the private sector, to deliver EDM technologies and services?
- What has been the measurable impact at the level of participating firms of implementing the EDM activities?
- What has been the knowledge gained from the project for understanding the constraints to EDM, especially the reluctance to invest in EDM technologies having a long payout period?
- Has the project directly resulted in energy savings among targeted firms?
- Has firm productivity increased as a result of the implementation of EDM activities?
- Has the efficiency of firm-level use of energy increased as a direct result of project activities?

Output Level Questions

- Have private-sector enterprises (e.g., equipment suppliers, consulting and engineering firms) in Morocco entered the EDM equipment and services markets or expanded their EDM activities?
- Have the planned activities under each project component (information and awareness, training, technical support, policy analysis) and in each sector (agroindustry, construction materials, and hotels) been carried out?

4. Selecting Methodologies to Answer Managers' Questions

Goal and Purpose Level Questions

Energy savings will need to be determined on two levels: micro (individual energy users) and macro (national). To determine energy savings at the micro level, first an energy "baseline" must be developed, consisting of data on past and present energy consumption for a sample of individual energy users. Under the information and awareness component of the project, such an energy use survey will be conducted and a database developed during the first year of the project by the technical assistance contractor. Based on this survey it will be possible to establish a null hypothesis, i.e., a prediction of what future energy consumption would be in the absence of the project. It is

against this null hypothesis that energy savings can be evaluated, by comparing it to actual consumption which will be measured in subsequent surveys.

The core of the evaluation will be the enterprises that directly benefit from the project's technical support -- those enterprises in which audits, technoeconomic studies, and technology applications are carried out. To assist in tracking energy savings, enterprises that participate in the project's technology applications will be required to monitor the technical and economic performance of the technology and report to the TA contractor.

In addition, annual energy consumption surveys will be carried out during every year of the project so that energy savings in other enterprises and across sectors can be monitored. Finally, to assist project evaluation, questionnaires will be sent annually to determine if EDM measures have been implemented as a result of information disseminated by the project and how those EDM technologies have performed. The project will work with the Direction de l'Energie (MEM) to develop national and sectoral energy consumption and investment baselines and to track energy savings on a national level.

An assessment must be made to determine if EDM know-how is being transferred to Moroccan institutions and individuals and if a capability is being developed to conduct project activities without external assistance. This can be done by determining each year what share of total project activities has been carried out, and successfully, by Moroccan institutions and individuals. This effort will also be assisted by the annual questionnaires described above.

Several measures should be used to determine whether the EDM equipment and services market has expanded as a result of the project. Existing consulting and engineering firms and equipment suppliers should be surveyed to determine if they have initiated or expanded EDM-related services. EDM equipment suppliers and consulting and engineering firms could be contacted either directly or through their professional association. Given the small size of the current EDM market, it should also be simple to determine if new EDM equipment suppliers enter the Moroccan market and if new consulting and engineering firms specializing in EDM are formed as a result of the project. Finally, it can be determined from import statistics and through surveys of energy users, suppliers, and consulting and engineering firms whether more EDM equipment is being imported and what share is coming from the United States.

~~Output-Level Questions~~

Answering the first question should be relatively straightforward. The first activity of the TA contractor after arrival in Morocco is to develop a draft work plan for the first two years of the project. During the project, detailed work plans will be prepared for each sector and for the remainder of the project overall. These workplans will indicate year-by-year, what and how many activities are to be carried out under each project component. Project performance can be measured against these workplans (e.g., How many engineers were trained? How many seminars were held? How many audits were conducted?). In addition, the TA contractor will submit detailed annual activity reports and action plans to the Mission which will assist in monitoring efforts.

Annex E

EVALUATION TERMS OF REFERENCE

Annex E

Attachment #1
Terms of Reference

Energy Demand Management Project
608-0193
Final Evaluation

ARTICLE I. Background

The Energy Demand Management Project (608-0193), with USAID life-of-project funding for $8,600,000, began in 1989, was amended in 1992 following the recommendations of the mid-term evaluation in December 1991. (The Clean Technology/Pollution Prevention (CTPP) component of the project was added in September 1993 with additional funding of $1.2 million. Both components are scheduled to end in September 1995.) The objective of the project is to promote efficient energy use in the Moroccan private sector through development of a market for high quality energy demand management (EDM) services. The project delivers services directly to private industry clients. Experience and data acquired through this assistance are being used to develop national-level policies aimed at fostering a sustainable, private sector led market in energy demand management services. Assistance is also being provided to the Ministry of Energy and Mines and other GOM entities, educational institutions, and professional associations, such as the Moroccan Energy Management Association, to promote widespread awareness in energy efficiency. A U.S. consulting firm, RCG/Hagler, Bailly, Inc., is implementing all components of the project, both directly and through local subcontractors. This final evaluation should assess whether the project objective was attained, analyze the benefits, and make recommendations for possible extension or follow-on activities in order to increase impact.

ARTICLE II. Evaluation Objective

The contractor chosen for this evaluation will provide a two-person technical team to evaluate the efficiency of project implementation and to make recommendations for a possible six-month extension period and for a possible follow-on activity; and to determine the impact of project activities on energy/raw materials usage and the economy of Morocco.

ARTICLE III. Scope of Work

The evaluation will examine implementation success: the strategy employed, the outputs produced, how the outputs related to the purpose, whether the assumptions were realistic, and the impact. The Evaluation Team will be responsible for determining the overall effectiveness of project activities to date. It will place particular emphasis on the impact of the project, both in terms of qualitative changes in the public awareness and availability of equipment and services, as well as in quantitative terms on companies' competitiveness, national energy

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and raw material use, investment and job creation. It will examine impact on the individual firm level, at the sectoral level and on the national scale. It will identify the primary beneficiaries of the project by targeted sector and company size.

Once in country, the team will meet with the institutional contractor, private sector, government counterparts, and USAID to refine evaluation methodology. Team members will retain a Moroccan consultant to conduct a survey of assisted companies (at a minimum, 50% of the companies assisted via audit, electricity and boiler efficiency analysis should be randomly selected and visited by the evaluation team and surveyors). The team will work carefully with the consultant to insure the validity of survey results and will conduct its own on-site interviews with clients and participants in the project. During this period, the team will make weekly reports of progress to the Project Monitoring Committee (composed of the Project Officers from USAID and MEM and the chief of party of the institutional contractor).

For each major area of project implementation, there will be several specific questions that will need to be answered during the course of the evaluation. The Final Report will set the context of energy/pollution prevention cost and use in Morocco, how the project fits into this context, and, through answering the listed questions, and others that will arise during the evaluation, determine the efficiency and impact of the project within this context. The report must detail the benefits of the project, as well as the principal beneficiaries.

1. Increased awareness and information (energy demand management and pollution prevention):

What were the most effective actions?
Is EDM/CTPP concept understood by managers within target sectors? Outside target sectors? At small- and medium-sized enterprise (SME) level? Is knowledge due to the project efforts?

What activities are sustainable after PACD? What activities need more work to become sustainable? What is recommended for follow up?

2. Technical assistance:

What has been the response to energy and environment audits and feasibility studies? Were energy and environment audit recommendations followed? For those that were followed, what has been the savings in terms of dollars and in terms of energy and non-quantifiable benefits? How can the audits be more closely linked to project impact? Who were the main beneficiaries of the project technical services (by sector and size)?

- For all forms of technical assistance implemented, what was the relationship between the estimated cost of investment and estimated savings to the real cost and real savings? How did this relationship compare across type and size of company?

- How could the demonstration projects be more effectively used in promotion of the EDM/CTPP concept and the sustainability of project services?

- What new, relevant programs (equipment, techniques) are being introduced in the country among the private and public sectors? What is the role of American equipment and know-how in this process?

- What is the impact of technical assistance with selected firms through energy and environment audits, technical and economic feasibility studies, and demonstration projects, in terms of firm-level energy/raw material savings, competitiveness, investment, and job creation.

3. Moroccan capacity:

- What capacity has been created by the project to conduct energy and environment audits and to implement energy demand management/CTPP techniques? Is it sustainable after the PACD? What more can be done in follow on activities? What capacity has been created outside the framework of the project?

4. Policy recommendations:

- What were the most appropriate policy studies in terms of promoting EDM concepts and sustainability? What changes did these studies lead to in the policy environment? Was the project approach appropriate for achieving policy change? What priority areas should be followed up after PACD?

- What is the role of project in promoting new policies? Has it been successful? What is the impact of policy reform on the national or macroeconomic level, in terms of energy savings, environmental benefits, new investments, increased competitiveness and job creation?

5. Private sector and sustainability:

- Has there been a market created in Morocco for the services provided by the project? Will the product "Energy/Raw Material Conservation" sell in Morocco? Is the market demand sufficient to make this type of activity sustainable in the country? What are the priority recommendations for any follow up?

6. Training (U.S. and in-country)

- What has been the impact of the training on the GOM and private enterprise? Is this impact quantifiable? If so, who were the primary beneficiaries and what were the benefits?

- Has training resulted in the creation of new businesses or extension of existing services to include energy- or environment-related services to the GOM and Moroccan private enterprise? What is recommended for follow up?

7. Other issues

- How effective ~~is~~ are the clean technology component and the strategy to pair pollution prevention with energy demand management?

- What has been the over all environmental impact of the project in terms of saving natural resources through increased savings of energy?

- Document the types of natural resource savings brought about by the clean technology component of the project (effluents, smoke, dust, recylcing, etc.).

ARTICLE IV. Deliverables

Seven days prior to departure, the team will submit to the USAID Project Officer five copies of a draft evaluation report and make an oral presentation to the Project Monitoring Committee. Based on comments from review of the draft report, the team will make appropriate revisions. The team leader will submit five copies of a final report to the Project Officer prior to departure from Morocco.

Fifteen copies of the final, printed report in French and in English will be delivered by air express to the USAID Project Officer within two weeks of the team's departure from Morocco. The team will provide USAID with computer diskettes containing both the French and English versions of the final report in World Perfect 5.1.

ARTICLE V. Performance Period

The evaluation will take place over a six-week period, starting on April 24, 1995. It should be completed on June 2, 1995. An evaluation debriefing shall be completed and the draft evaluation report submitted to USAID one week before the team leaves Morocco.

Prior to departure for Morocco, the team will be allotted one week in Washington for briefings in Washington with AID/W, RCG/Hagler, Bailly and the World Bank to discuss terms of reference, the overall energy background for Morocco, sampling and impact evaluation techniques, and for contacts with the USAID and Bank Geographical Desk and the appropriate technical offices in USAID Global bureau.

Level of Effort: 3 person-months

Logistical Support: The contractor for the evaluation is responsible for all logistical support for the evaluation team. It will provide necessary office space, transportation (vehicle rentals), printing, typing, transformers, word processing, translation, etc. Team members are advised to carry with them their own word processing equipment. The evaluation contractor is authorized to use funds provided in the PIO/T to assure adequate word processing and micro-computer support.
Payment: The payment office will be the USAID Controllers's Office in Rabat, Morocco. Payment will be authorized upon USAID acceptance of the deliverables and receipt of contractor's invoice.

ARTICLE VI. Qualifications

The Evaluation Team will consist of two experts. The Team Leader will be a PhD in economics and will have at least ten years experience in policy analysis regarding private sector and energy use. Much of this experience should have been in developing countries. The second team member will be an energy engineer/conservation specialist, with a minimum of six years experience in energy audit, preferably in the developing world. There is a strong preference for team members who have worked in North Africa and who are familiar with the energy problems, and solutions, of the area. Both will be fully fluent in English.

In order to function effectively, team members must have sufficient command of the French language to be able to work independently in the language. French language proficiency at the Foreign Service Institute Level S3/R3 is necessary.

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Annex F

EXHIBITS

Exhibit 1

RENCONTRES DE SENSIBILISATION: 1990 - A CE JOUR

DATE	No.	FORMATION	ORGANISATEUR	PERSONNES / ORGANISM BENEFICIAIRES	NOMBRE DE PARTICIPANT	ANIMATEURS / INTERVENANTS	VILLE
[illegible]							
28 FEVRIER	1	GESTION DE L'ENERGIE DANS LES HOTELS AU MAROC	GEM	HOTELIERS	27	C.G., S.G	AGADIR
[illegible]							
26 - 27 JANVIER	2	SYMPOSIUM SUR LA COGENERATION ET LA PRODUCTION AUTONOME DE L'ELECTRICITE	AMGE/GEM	INDUSTRIELS	200	CONFERENCIERS: INTERNATIONALIX ET NATIONA[illegible]	CASABLANCA
12 JUILLET	3	RENCONTRE DES DECIDEURS (ENERGIE)	GEM/MARKETIS	INDUSTRIELS	15	CONFERENCIERS	AGADIR
[illegible]							
16 MAI	4	RENCONTRE DES DECIDEURS	GEM/MARKETIS	DECIDEURS	70	GR, AB, YG, ROYER (MEDITERRE), BENYAKHLEF (ONA), DALLAS (CISE) DE MAYNADIER (IMCC), HRADSKY & SEBTI (USAID), BENLAHCEN (BEACH) MARTY (ASSAMAK), CARROLL, BOUHOUD (Chamb C.)	AGADIR
18 MAI	5	RENCONTRE DES DECIDEURS	GEM/MARKETIS	DECIDEURS	50	GR, AB, YG, ROYER (MEDITERRE), BENYAKHLEF (ONA), DALLAS (CISE) DE MAYNADIER (IMCC), EL KOUCH (ASMAR), USAID	MARRAKECH
28 OCTOBRE	6	RENCONTRE DES DECIDEURS	GEM/MARKETIS	DECIDEURS	80	GR, AB, YG, ROYER (MEDITERRE), BENYAKHLEF (ONA), DALLAS (CISE) BENZEKRI (Ass. Hom&Env), FARBMAN & SEBTI (USAID), FERNANDEZ (AZT DE MAYNADIER (IMCC), AJBAR (SAFRIPAC),	TANGER
[illegible]							
25 JANVIER	7	RENCONTRE DES DECIDEURS	GEM/MARKETIS	DECIDEURS	120	GR, AB, YG, ROYER (MEDITERRE), BENYAKHLEF (ONA), DALLAS (CISE) USAID, Wilaya, Iskane, COTEF	FES

TOTAL A CE JOUR	562

Exhibit 2

Type de Manifestation	Date	Média concerné
Invitation RTM Chaine Française	2 Novembre 93	RTM
Rencontre Régionale AGADIR	16 Mai 1994	L'opinion, La vie Economique, Le Matin
Rencontre Régionale Marrakech	18 Mai 1994	L'opinion, La vie Economique, 2 M Internationale
Rencontre Régionale Tanger	26 Octobre 1994	La vie Economique, L'opinion,la MAP, Radio Méditerrané Internationale, RTM locale
Rencontre Régionale Fès	25 Janvier 1995	L'opinion, RTM locale
Invitation RTM Chaine Arabe	22 Mai 1995	RTM Arabe
Emission de Télévision Ecologia	18 Avril 1995	Télévision (RTM)

Exhibit 3 ***DIFFUSION DU GEM-O-GRAMME***

DATE DE DISTRIBUTION	NUMERO	DIFFUSION	OBSERVATIONS
[illegible] 1991			
MAI	1	300	+ 50 MARRAKECH WORLD BANK/UNDP SEMINAR +40 CASA/REGIONAL HOTEL ASSOCIATION
SÈPTEMBRE	2	350	+depliants ateliers
NOVEMBRE	3	400	+depliants ateliers
DECEMBRE	4	400	
[illegible] 1992			
FEVRIER	5	700	
MARS	6	700	
MAI	7	850	
JUILLET	8	1000	INSERTION D'UNE PAGE AMGE
OCTOBRE	9	1000	
[illegible] 1993			
JANVIER	10	1050	
AVRIL	11	1100	
JUILLET	12	1200	
OCTOBRE	13	1200	
[illegible] 1994			
JANVIER	14	1200	
MARS	15	1300	Augmenté à 12 pages pour y inclure le Clean Tech
JUIN	16	1300	
AOUT	17	700	Mise à jour de la base de données
DECEMBRE	18	700	
[illegible] 1995			
MARS	19	700	

Exhibit 4

PROGRAMME D'ACTIVITES

DATE	ACTIVITES	LIEU	PARTICIPANTS
30/06/92.	Assemblée Générale constitutive.	Royal Mansour.	95
22-23/09/92.	Premières journées sur les techniques d'utilisation des G P L. Visite technique de la Samir.	E.H.T.P Casablanca.	80
25-27/01/93.	Symposium sur la Cogénération et la Production Autonome de l'électricité.	Royal Mansour.	240
09/06/93.	Rencontre professionnelle sur le Tiers investisseur.	Royal Mansour.	70
18/06/93.	Dossier spécial Energie en collaboration avec la Vie economique.		
26/06/93.	1ère Assemblée Générale.	Cinouca.	40
26/06/93.	Visite Technique d'une cimenterie.	Cinouca.	40
29/09/93.	Visite technique d'une centrale électrique.	Centrale Thermique Mohammédia.	60
15/11/93.	Etude de l'impact des délestages sur les entreprises, en collaboration avec l'Economiste.		
01-05/12/93.	Participation à MINERGIE'93.	Foire de Casablanca.	
03/12/93.	Rencontre Professionnelle sur la Maîtrise de l'Energie : Gestion de la charge	Royal Mansour.	167
09/02/94	Energie-Environnement	E. H. T. P.	130
18/04/94	Perspectives d'utilisation du gaz naturel au Maroc	E. N. I. M	220
23/09/94	Assemblée Générale de l' A. M. G. E.	Hôtel Riad Salam	
19/10/94	Nouvelles orientations du secteur électrique au Maroc	Hôtel Sheraton	
15/11/94	Gestion de la charge par le stockage du froid	Hôtel Sheraton	
15/12/94	Enjeux du marché des produits pétroliers	Hôtel Sheraton	
18/01/95	Règlementation des appareils à vapeur	Hôtel Sheraton	
02/95	Mémorandum : Energie Point de vue de l' A. M. G. E.		

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Exhibit 5-1

TABLEAU RECAPITULATIF DES ACTIVITES D'AUDITS ENERGETIQUES ET ENVIRONNEMENTAUX ET D'ETUDES DE FAISABILITES REALISEES DE 1990-95

	AUDIT	Facture Annuelle Energie/Eau	Consommation Energétique (Tep)	Econ. (Tep)	Economie Nationale $	Gains tep (%)	Gains Identifiés (Dh)	Coûts Dh (%)	Nombre Projets d'EE	Montant Investiss. (Dh)	Temps Retour Moyen (Mois)
1	LAITERIE	9,000,000	3,400	450	63,000	13%	750,000	8%	18	875,000	14
2	LAITERIE	4,120,000	1,960	485	67,900	25%	920,000	22%	18	1,340,000	17
3	CONSERVERIE	1,500,000	742	130	18,200	18%	261,000	17%	5	123,000	6
4	HOTEL	2,125,000	576	164	22,946	28%	638,000	30%	21	366,850	7
5	USINE CERAMIQUE	4,000,000	1,700	463	64,758	27%	1,157,000	29%	3	3,515,000	36
6	HOTEL	2,800,000	705	179	25,060	25%	758,000	27%	13	425,000	7
7	CIMENTERIE	81,000,000	52,000	2,907	406,980	6%	4,400,000	5%	9	4,460,000	12
8	CONSERVERIE	3,134,000	947	290	40,600	31%	961,700	31%	9	948,000	12
9	HOTEL	3,310,000	928	206	28,840	22%	636,000	19%	15	585,350	11
10	SUCRERIE	Participation à la campagne de mesures en collaboration avec les experts de SOFRECO									
11	HOTEL	1,451,000	431	98	13,720	23%	350,000	24%	10	264,000	9
12	CIMENTERIE	194,000,000	117,000	12,000	1,680,000	10%	25,570,000	3%	7	32,865,000	15
13	HOTEL	4,018,900	1,101	43	6,020	4%	122,920	3%	2	108,500	11
14	BOISSON	1,584,000	530		Etude Technico-Economique sur choix de chaudière						
15	CIMENTERIE	174,200,000	115,000	360	50,400	0%	2,224,910	1%	2	3,550,000	19
16	HOTEL	3,068,000	809	245	34,300	30%	870,000	28%	9	489,000	7
17	HOTEL	2,551,000	603	232	32,480	39%	685,000	27%	9	880,000	15
18	BOISSON	1,257,100	429	20	2,796	5%	590,000	48%	6	337,000	7
19	PAPETERIE	4,667,000	1,772	121	16,940	7%	558,000	12%	8	737,000	16
20	CIMENTERIE	94,916,499	58,900	3,181	445,340	5%	7,481,400	8%	6	14,430,000	23
21	HOTEL	654,547	181	15	2,100	8%	48,000	7%	6	42,000	11
22	SUCRERIE	14,800,000	11,264	3,552	497,280	32%	7,104,000	48%	14	13,640,000	23
23	HOTEL	1,044,000	324	63	8,820	19%	172,000	16%	6	207,000	14
24	HOTEL	1,192,400	210	50	7,000	24%	127,000	11%	4	44,000	4
25	HOTEL	2,061,000	589	130	18,130	22%	429,000	21%	11	656,600	18
26	LAITERIE	1,930,000	539	80	11,172	15%	256,555	13%	6	133,000	6
27	USINE TEXTILE	30,399,000	10,510	1,837	257,173	17%	4,532,600	15%	12	2,784,400	7
28	SOCIETE DE SERVICES	16,632,659	4,782	199	27,810	4%	784,000	5%	2	650,000	10
29	HOTEL	1,404,000	239	71	9,884	30%	182,600	13%	6	178,300	12
30	HOTEL	3,792,000	845	75	10,458	9%	439,800	12%	5	359,300	10
31	HOTEL	1,704,000	403	44	6,199	11%	130,300	8%	4	166,800	15
32	HOTEL	4,171,916	868	142	19,880	16%	794,000	19%	9	868,000	13
33	CONSERVERIE	634,000	178	41	5,740	23%	117,500	19%	5	139,500	14
34	BLANCHISSERIE	570,350	120	32	4,480	27%	257,000	45%	3	102,000	5
35	CARTON ET PAPIER	2,093,000	767	38	5,312	5%	127,000	6%	6	116,000	11
36	HOTEL	3,389,058	831	222	31,080	27%	855,000	25%	8	684,000	10
37	USINE TEXTILE (environnement)						4,214,000		11	3,592,000	
38	CIMENTERIE (environnement)						32,346,700		13	136,338,000	
39	CONSERVERIE (environnement)						36,000		6	75,000	
40	BOISSON (energ. & envir.)	2,394,000	672	148	20,720		442,000		8	288,700	
41	USINE TEXTILE (energ.. & envir.)	15,001,480	2,772	716	100,212	26%	2,343,152	16%	13	1,704,600	9
42	CONSERVERIE (energ. & envir.)	1,868,006	712	104	14,504	15%	345,600	19%	13	636,100	22
43	TANNERIE (environnement)	161,580	46	0	0	0%	97,000	60%	3	44,000	5

NB: Les économies d'énergie et de ressources naturelles indiquées représentent les projets proposés et non les réalisations concrètes.

Exhibit 5-2

TABLEAU RECAPITULATIF DES ACTIVITES D'AUDITS ENERGETIQUES ET D'ETUDES DE FAISABILITES REALISEES DE 1990-93

	AUDIT	Facture Annuelle Energie/Eau	Consommation Energétique (Tep)	Econ. (Tep)	Economie Nationale $	Gains tep (%)	Gains Identifies (Dh)	Gains Dh (%)	Nombre Projets d'EE	Montant Investiss. (Dh)	Temps Retour Moyen (Mois)
	TOTAL - REPORT										
44	AGRO-ALIMENTAIRE	4,852,000	1,900	366	51,254	19%	752,900	16%	6	339,400	5
45	TEXTILE	RAPPORT EN COURS D'ELABORATION									
46	TEXTILE	RAPPORT EN COURS D'ELABORATION									
47	HOTELLERIE	RAPPORT EN COURS D'ELABORATION									

NB: Les économies d'énergie indiquées représentent les projets proposés et non les réalisations concrètes.

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Exhibit 6-1

OPERATION DE REGLAGE DES CHAUDIERES: 1990-92

No.	SECTEUR D'ACTIVITE	CONSOMMATION		ECONOMIES		
		TEP/AN	DH	TEP	DH	%
[illegible]						
1	ALIMENT DE VOLAILLE	367.92	932,938.00	7.59	11,671.00	2.06
2	LEVURE	1,200.00	2,322,000.00	42.85	82,910.00	3.57
3	PNEUMATIQUE	480.00	928,800.00	6.00	11,606.15	1.25
4	TEXTILE	1,152.00	2,229,120.00	1.05	2,838.85	0.09
5	CHOCOLATERIE	98.00	248,500.00	0.24	683.41	0.24
6	AGRO-ALIMENTAIRE	960.00	1,935,000.00	7.99	16,106.36	0.83
7	CARTON ET PAPIER	23.04	58,422.86	2.79	7,068.44	12.10
8	AGRO-ALIMENTAIRE	48.60	121,714.29	0.94	2,381.15	1.96
		4,328.96	8,776,495.14	69.45	134,384.56	1.60
[illegible]						
9	HOTELLERIE	49.00	116,963.00	4.34	10,578.75	8.86
10	HOTELLERIE	98.00	233,926.00	2.81	6,851.32	2.87
11	HOTELLERIE	64.64	310,272.00	3.54	16,832.88	5.48
12	HOTELLERIE	70.70	339,360.00	20.06	95,334.17	28.37
13	HOTELLERIE	64.64	154,295.68	0.00	0.00	0.00
		346.98	1,154,816.68	30.76	129,597.12	8.86
[illegible]						
14	TEXTILE	144.00	298,500.00	10.56	21,890.00	7.33
15	AGRO-ALIMENTAIRE	950.40	1,970,100.00	49.92	103,480.00	5.25
16	TEXTILE	624.00	1,293,500.00	18.11	37,531.40	2.90
17	TEXTILE					
18	TEXTILE	144.00	298,100.00	5.81	12,043.65	4.03
19	TEXTILE					
20	TEXTILE	2,160.00	4,477,569.00	59.66	123,670.21	2.76
21	CONSERVERIE	144.00	298,500.00	2.74	5,679.79	1.90
22	CARTON ET PAPIER	1,728.00	3,582,000.00	45.12	93,530.00	2.61
23	PNEUMATIQUE	1,920.00	3,980,000.00	38.40	79,600.00	2.00
24	CHIMIQUE & PARACHIMIQU	144.00	298,500.00	2.88	5,970.00	2.00
25	ALGUES'	1,728.00	3,582,000.00			
26		528.00	1,094,500.00	18.24	37,810.00	3.45
27	ALIMENTS DE VOLAILLE	539.00	1,117,302.88		0.00	
28	TEXTILE		5,182,292.00			
		10,753.40	27,473,194.08	251.44	521,205.05	2.34

Exhibit 6-2

OPERATION DE REGLAGE DES CHAUDIERES: 1993 - A CE JOUR

No.	SECTEUR D'ACTIVITE	CONSOMMATION		ECONOMIES		
		TEP/AN	DH	TEP	DH	%
[illegible]						
29	LEVURE	1,420.80	2,960,000.00	102	213,120.00	7.2
30	PNEUMATIQUE	1,152.00	2,400,000.00	169	352,800.00	14.7
31	TEXTILE	576.00	1,200,000.00	3	7,200.00	0.6
32	AGRO	1,440.00	3,000,000.00	168	351,000.00	11.7
33	TEXTILE	2,160.00	4,500,000.00	95	198,000.00	4.4
34	CARTON ET PAPIER	480.00	1,000,000.00	16	34,000.00	3.4
35	AGRO	480.00	1,000,000.00	0	0.00	0.0
36	TEXTILE	960.00	2,000,000.00	26	54,000.00	2.7
37	TEXTILE	288.00	600,000.00	5	10,200.00	1.7
38	AGRO	5,280.00	11,000,000.00	433	902,000.00	8.2
39	AGRO	5,280.00	11,000,000.00	174	363,000.00	3.3
40	AGRO	5,280.00	11,000,000.00	137	286,000.00	2.6
41	CARTON ET PAPIER	480.00	1,000,000.00	37	77,000.00	7.7
42	AGRO	1,152.00	2,400,000.00	0	0.00	0.0
43	TABAC	480.00	1,000,000.00	18	37,500.00	3.8
		26,908.80	56,060,000.00	1,385.24	2,885,920.00	5.15
[illegible]						
44	LEVURE	1,200.00	2,322,000.00	60	125000	5
45	TEXTILE					
46	TEXTILE					
		1,200.00	2,322,000.00	60.00	125,000.00	5.00

GAIN A CE JOUR	3,796,106.73

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Exhibit 7-1

OPTIMISATION DE LA REDEVANCE ELECTRIQUE: 1990-92

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
REALISEE PAR GEM EN CONTRAT [illegible]						
1	AGRO-ALIMENTAIRE	1,890	700	66,850.00	22,000.00	4
2	AGRO-ALIMENTAIRE	3,350	1,200	145,000.00	90,000.00	8
3	MATERIAUX DE CONSTRUCTION	1,800	900	94,000.00	36,600.00	5
4	MATERIAUX DE CONSTRUCTION	1,250	500	0.00	0.00	–
5	TEXTILE	2,680	2,000	147,570.00	50,000.00	4
6	TEXTILE	3,310	1,800	196,000.00	40,000.00	2.4
7	TEXTILE	1,600	1,000	49,700.00	54,000.00	13
8	CHAUSSURES	2,250	1,200	104,300.00	0.00	0
9	INJECTION-PLASTIQUE	1,600	500	81,000.00	50,000.00	7.4
10	PNEUMATIQUE	6,500	3,000	93,000.00	191,000.00	24.7
		26,230	12,800	977,420.00	533,600.00	6.5
REALISEE PAR GEM EN [illegible]						
11	EMBALLAGE	1,000	300	80,000.00	131,000.00	20
12	ARO-ALIMENTAIRE	500	400	37,000.00	16,000.00	31
13	CUTELLERIE	630	100	13,000.00	18,200.00	17
14	MATERIAUX DE CONSTRUCTION	2,860	1,600	68,000.00	66,000.00	12
15	FABRICATION DE GAZ INDUSTRIELS	2,100	1,400	103,000.00	74,000.00	9
16	FORGEAGE	1,000	400	36,000.00	3,600.00	1
17	MOQUETTE	630	350	48,000.00	32,000.00	8
18	EQUIPEMENT ELECTRIQUE	6,000	2,500	434,000.00	264,000.00	7
19	TRANSFORMATION DE LA MELASSE	630	430	33,000.00	3,500.00	1
20	PEINTURE	1,850	600	17,000.00	28,000.00	20
21	TEXTILE	630	300	38,000.00	16,000.00	5
22	CARTON ET PAPIER	630	300	72,000.00	79,000.00	13
		18,460	8,680	979,000.00	731,300.00	9

Exhibit 7-2

OPTIMISATION DE LA REDEVANCE ELECTRIQUE: 1993

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
[illegible]						
23	TEXTILE	2,205	500	64,000.00	120,000.00	23
24	HOTELLERIE	500	400	38,000.00	46,000.00	15
25	AGRO-ALIMENTAIRE	250	200	46,000.00	31,000.00	8
26	AGRO-ALIMENTAIRE	400	350	34,000.00	3,500.00	1
27	MOTEURS, GROUPES ELECTROGENES	250	100	17,800.00	34,000.00	23
28	TEXTILE	2,520	1,800	197,000.00	205,000.00	12
29	TEXTILE	1,575	945	46,700.00	147,000.00	36
30	TEXTILE	1,890	500	43,000.00	142,000.00	40
31	TEXTILE	12,500	6,500	488,000.00	547,000.00	14
32	HOTELLERIE	3,000	1,000	104,000.00	163,000.00	19
33	PLASTIQUES	400	160	11,800.00	16,000.00	16
34	TEXTILE		200	98,600.00	112,000.00	14
35	AGRO-ALIMENTAIRE		350	39,000.00	84,000.00	26
36	CARTON ET PAPIER		1,200	47,000.00	110,000.00	28
37	FROID ET CLIMATISATION		272	3,000.00	12,000.00	48
38	MINES			489,000.00	474,000.00	12
		25,490	14,477.00	1,766,900.00	2,241,500.00	

Exhibit 7-3

CHAINE HOTELIERE SALAM: OPTIMISATION DE LA REDEVANCE ELECTRIQUE (1993)

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
[redacted]						
39	HOTELLERIE			104,000.00	120,000.00	14
40	HOTELLERIE			46,000.00	25,000.00	7
41	HOTELLERIE			28,000.00	20,000.00	9
42	HOTELLERIE			14,000.00	95,000.00	81
43	HOTELLERIE			4,000.00	12,000.00	36
44	HOTELLERIE			3,000.00	15,000.00	60
45	HOTELLERIE			4,000.00	15,000.00	45
46	HOTELLERIE			39,000.00	23,000.00	7
47	HOTELLERIE			36,000.00	20,000.00	7
48	HOTELLERIE			26,000.00	110,000.00	51
49	HOTELLERIE			16,000.00	20,000.00	15
50	HOTELLERIE			14,000.00	22,000.00	19
51	HOTELLERIE			12,000.00	31,000.00	31
52	HOTELLERIE			6,000.00	15,000.00	30
				352,000.00	543,000.00	19

Exhibit 7-4

ATELIER: OPTIMISATION DE LA REDEVANCE ELECTRIQUE: 1993 - AGADIR

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
REALISEE PAR GEM [illegible]						
53	AGRO-ALIMENTAIRE	1260	1200	171,200.00	38,200.00	3
54	AGRO-ALIMENTAIRE	630	550	114,600.00	100,300.00	11
55	AGRO-ALIMENTAIRE	800	200	94,200.00	61,900.00	8
56	AGRO-ALIMENTAIRE	400	270	63,500.00	36,200.00	7
57	HOTELLERIE	1000	300	35,500.00	12,000.00	4
58	HOTELLERIE	800	350	16,800.00	25,600.00	9
59	AGRO-ALIMENTAIRE	680	450	26,600.00	31,500.00	14
60	AGRO-ALIMENTAIRE	630	500	23,500.00	45,200.00	23
61		1130	350	15,500.00	19,600.00	15
		7330	4170	561,400.00	370,500.00	8

ATELIER: OPTIMISATION DE LA REDEVANCE ELECTRIQUE: 1994 - MARRAKECH

REALISEE PAR GEM [illegible]						
62	HOTELLERIE	1600	200	85,100.00	117,900.00	17
63	HOTELLERIE	800	400	165,900.00	67,200.00	5
64	HOTELLERIE	250	200	60,100.00	36,000.00	8
65	HOTELLERIE	400	250	35,200.00	24,000.00	9
		3050	1050	346,300.00	245,100.00	9

Exhibit 7-5

ENTREPRISES DE TANGER: OPTIMISATION DE LA REDEVANCE ELECTRIQUE (1994)

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
REALISEE PAR GEM						
66	INDUSTRIE METALLIQUE & METALLURGIQUE	1,890	1,500.00	134,000.00	216,120.00	19
67		1,240	900.00	78,000.00	111,518.00	17
68	INDUSTRIE METALLIQUE & METALLURGIQUE	1,260	1,000.00	97,470.00	130,856.00	16
69	TEXTILE	3,780	2,500.00	192,375.00	243,236.00	15
70		630	400.00	39,271.00	60,809.00	19
71	MATERIAUX DE CONSTRUCTION	1,000	700.00	86,164.00	60,809.00	8
72	TEXTILE	1,830	1,400.00	177,000.00	82,270.00	5
73	MATERIAUX DE CONSTRUCTION	1,260	700.00	80,110.00	130,856.00	20
74	MATERIAUX DE CONSTRUCTION	630	630.00	73,718.00	82,270.00	13
75	MATERIAUX DE CONSTRUCTION	800	800.00	98,496.00	82,270.00	10
76		630	315.00	33,198.00	60,809.00	22
77	AGRO-ALIMENTAIRE	1,260	630.00	42,938.00	60,809.00	17
78	AGRO-ALIMENTAIRE	630	500.00	42,938.00	60,809.00	17
79		630	600.00	58,482.00	82,270.00	17
80		400	400.00	59,508.00	50,810.00	10
81	SERVICES	3,465	2,000.00	397,114.00	106,624.00	3
82	TEXTILE	1,430	1,000.00	71,820.00	92,181.00	15
83	TELECOMMUNICATIONS	2,125	1,800.00	195,966.00	60,809.00	4
84		400	400.00	81,012.00	60,809.00	9
85	TEXTILE	400	400.00	142,548.00	60,809.00	5
		25,690	18,575.00	2,182,248.00	1,897,853.00	11

Exhibit 7-6

OPTIMISATION DE LA REDEVANCE ELECTRIQUE: 1994

No.	SECTEUR D'ACTIVITE	PUISSANCE INSTALLEE (kVA)	PUISSANCE SOUSCRITE (kVA)	GAIN (DH/AN)	INVESTISSEMENT (DH)	TEMPS DE RETOUR
REALISEE PAR GEM						
86	TEXTILE		400	182,200.00	151,000.00	10
87	GLACE	500	400	18,800.00	36,200.00	24
88	GLACE	500	400	20,000.00	37,900.00	23
			1,200.00	221,000.00	225,100.00	13

TOTAL A CE JOUR	7,386,268.00

Exhibit 8 *ATELIERS DE FORMATION ORGANISES PAR LE PROJET GEM DE 1990 - A CE JOUR*

DATE	ATELIER	NOMBRE DE PARTICIPANTS	ANIMATEURS
1990 CASA, MARRAKECH, MEKNES, FES, TANGER, AGADIR, SAFI			
	TECHNIQUES DE GESTION DE L'ENERGIE	79	A. BENALLOU, A. FASSI FIHRI
	AMELIORATIONS DES CHAUDIERES	92	M.B., CHAOUI
1991-1992 CASA, MARRAKECH, FES			
	TECHNIQUES DE GESTION DE L'ENERGIE	36	A.BENALLOU
	AMELIORATIONS DES CHAUDIERES	37	M.B., CHAOUI .
	SYSTEMES ELECTRIQUES	94	EL KHYARI, S.G.
	SYSTEMES VAPEUR	72	M.B., BOUANANI
1992 PREMIERE SERIE CASA			
	TECHNIQUES DE GESTION DE L'ENERGIE	23	A.L., Y.G.
	AMELIORATION DES CHAUDIERES	28	M.B., CHAOUI
	SYSTEMES ELECTRIQUES	33	EL KHYARI, S.G.
	SYSTEMES VAPEUR	29	M.B., BOUANANI
1993 DEUXIEME SERIE AGADIR			
	SYSTEMES ELECTRIQUES	10	EL KHYARI, S.G.
	SYSTEMES VAPEUR	8	M.B., A. L.
1994 PREMIERE SERIE CASA			
	GESTION DE L'ENERGIE	12	A.B., Y.G.
	SYSTEMES ELECTRIQUES	16	A.E., L.S.
	SYSTEMES VAPEUR	3	M.B., S.B.
	AMELIORATIONS DES CHAUDIERES	annulé	
	SYSTEMES FRIGORIFIQUES	annulé	
1994 DEUXIEME SERIE CASA			
	TECHNIQUES DE GESTION DE L'ENERGIE	13	A.B., Y.G.
	SYSTEMES ELECTRIQUES	14	A.E., L.S.
1995 PREMIERE SERIE CASA			
	PRODUCTION ET DISTRIBUTION DE LA VAPEUR	14	M.B., S.B., Chaoui
	GESTION DES RESSOURCES NATURELLES	14	S.H., A.L.
	SYSTEMES FRIGORIFIQUES	3	Y.G., M.B.
1995 DEUXIEME SERIE CASA			
	SYSTEMES ELECTRIQUES		
	GESTION DES RESSOURCES NATURELLES		
	SYSTEMES FRIGORIFIQUES		
	TOTAL A CE JOUR	**635**	

Exhibit 9

SEMINAIRES DE FORMATION "A LA CARTE" ET/OU EN COLLABORATION AVEC D'AUTRES ORGANISMES: 1990 A CE JOUR

DATE	No.	FORMATION	ORGANISATEUR	PERSONNES / ORGANISMES BENEFICIAIRES	NOMBRE DE PARTICIPANTS	ANIMATEURS / INTERVENANTS	VILLE
1990							
7-27 MARS	1	AUDIT ENERGETIQUE	GEM	BUREAUX D'ETUDES/MEM	15	M.O.	RABAT
2 jours	2	GESTION DE L'ENERGIE DANS LE HOTELS	GEM	CHAINE SAFIR: DIRECTEURS TECHNIQUES DIRECTEURS GENERAUX	 11 14	 Y.G., M.B., S.G. Y.G., M.B., S.G.	 CASABLANCA CASABLANCA
1991							
10-14 JUIN	3	GESTION INFORMATIQUE DES BILANS MATIERE ET THERMIQUE DANS LES CIMENTERIES	GEM	CIMENTERIES	8	A.L., Y.G.	RABAT
1992							
13-17 JANVIER	4	TECHNIQUES DE MAITRISE DE L'ENERGIE: FORMATION EN ENERGIE POUR LES NOUVEAUX TECHNICIENS DE LA CIOR	GEM	NOUVEAUX TECHNICIENS DE LA CIOR	40	AIT BASSIDI	OUJDA
17 MARS	5	L'AMELIORATION DE LA PERFORMANCE DES INSTALLATIONS INDUSTRIELLES	GEM	CIMENTERIE CINOUCA	18	A.L., S.G., EL MERNISSI	CASABLANCA
13-17 AVRIL	6	TECHNIQUES D'AMELIORATION DES PERFORMANCES ENERGETIQUES DES UNITES INDUSTRIELLES	ENIM/GEM	INDUSTRIELS	45	A.L., Y.G., M.B., S.G., CHAOUI, MESSAHO, ALI HAJJI	RABAT
5 Jours en MAI	7	TECHNIQUES DE MAITRISE DE L'ENERGIE DANS LA SUCRERIE	GEM	SUCRAFOR: CADRES ET AGENTS TECHNIQUES	55	Y.G., M.B., AIT BASSIDI	ZAIO
18 OCTOBRE & 20 NOVEMBRE	8	GESTION ET ECONOMIE DE L'ENERGIE DANS LES HOTELS	GEM	HOTELIERS	9 11	S.G., Y.G. S.G., Y.G.	CASABLANCA MARRAKECH
1993							
11-12 FEVRIER	9	TRAITEMENT ET CONDITIONNEMENT DES EAUX DE CHAUDIERE ET DES CIRCUITS DE REFROIDISSEMENT	ENIM/GEM	INDUSTRIELS	40	Y.G., BELHAJ	RABAT
26 MAI	10	GESTION ET ECONOMIE DE L'ENERGIE DANS LES HOTELS	MARKETIS/GEM	HOTELIERS	15	YG & SG	AGADIR
18 JUIN	11	SYSTEMES ELECTRIQUES	GEM	ODEP	9	MB, A.E.	CASABLANCA
25 NOVEMBRE	12	OPTIMISATION DE LA REDEVANCE ELECTRIQUE (ORE)	MARKETIS/GEM	INDUSTRIELS/HOTELIERS	9	S.H, A.E, S.G.	AGADIR
DECEMBRE	13	PREVENTION DE LA POLLUTION	GEM/WEC	GEM/BUREAUX/MINISTERES	25	DUPERRAY/McCUBBIN	RABAT/TANGER
1994							
3 FEVRIER	14	OPTIMISATION DE LA REDEVANCE ELECTRIQUE (ORE)	MARKETIS/GEM	HOTELIERS/INDUSTRIELS	4	A.E, A.I.	MARRAKECH
18-22 AVRIL	15	TECHNIQUES D'AMELIORATION DES PERFORMANCES ENERGETIQUES DES UNITES INDUSTRIELLES	ENIM/GEM	INDUSTRIELS	25	Y.G., M.B., S.G., A.E. CHAOUI, MESSAHO, ALI HAJJI	RABAT
3 Mai	16	LES ENERGIES ALTERNATIVES	ENIM/GEM	CIMENTIERS	10	EXPERTS DU WEC/ FRANK STEVENS & FRANK PHILLIPS	RABAT
26 Mai	17	TRAITEMENT ET CONDITIONNEMENT DES EAUX DE CHAUDIERE ET DES CIRCUITS DE REFROIDISSEMENT	ENIM/GEM	INDUSTRIELS	25	Y.G., BELHAJ	RABAT
28-30 SEPTEMBRE	18	AUDIT ENERGETIQUE ET BILAN MATIERE	GEM	MEMBRES CELLULE CIMENT	10	A.E.	ASMENT
				TOTAL A CE JOUR	**398**		

Exhibit 10

FORMATION D'ETUDIANTS: ECOLES D'INGENIEURS: 1992 - A CE JOUR

DATE	No.	FORMATION	ORGANISATEUR	PERSONNES / ORGANISME BENEFICIAIRES	NOMBRE DE PARTICIPANT	ANIMATEURS / INTERVENANTS	VILLE
1992							
PRINTEMPS		AUDIT ENERGETIQUE	GEM/ENIM	ETUDIANTS ENIM	10	Y.G., A.L.	RABAT
		SYSTEMES VAPEUR	GEM/ENIM	ETUDIANTS ENIM	10	M.B., A. Chaoui, Ghinaoui (TC Maroc)	RABAT
1993							
PRINTEMPS		GESTION DE L'ENERGIE	GEM/ENIM	ETUDIANTS ENIM	10	Y.G.	RABAT
		SYSTEMES VAPEUR	GEM/ENIM	ETUDIANTS ENIM	10	M.B.	RABAT
		SYSTEMES ELECTRIQUES	GEM/ENIM	ETUDIANTS ENIM	10	A.E.	RABAT
		AMELIORATIONS DES CHAUDIERES	GEM/ENIM	ETUDIANTS ENIM	10	A.Chaoui, M.B.	RABAT
PRINTEMPS		AUDIT ENERGETIQUE (AGRO-ALIMENTAIRE)	GEM/IAV	ETUDIANTS IAV (GIA)	20	M.B.	RABAT
1994							
PRINTEMPS		GESTION DE L'ENERGIE	GEM/ENIM	ETUDIANTS ENIM	10	Y.G.	RABAT
		SYSTEMES VAPEUR	GEM/ENIM	ETUDIANTS ENIM	10	M.B.	RABAT
		SYSTEMES ELECTRIQUES	GEM/ENIM	ETUDIANTS ENIM	10	A.E.	RABAT
		AMELIORATIONS DES CHAUDIERES	GEM/ENIM	ETUDIANTS ENIM	10	A.Chaoui	RABAT
AUTOMNE		GESTION DE L'ENERGIE	GEM/ENIM	ETUDIANTS ENIM	8	A.B.	RABAT
		SYSTEMES VAPEUR	GEM/ENIM	ETUDIANTS ENIM	8	S.B.	RABAT
		SYSTEMES ELECTRIQUES	GEM/ENIM	ETUDIANTS ENIM	8	A.E.	RABAT
		AMELIORATIONS DES CHAUDIERES	GEM/ENIM	ETUDIANTS ENIM	8	A.Chaoui	RABAT
		SYSTEMES FRIGORIFIQUES	GEM/ENIM	ETUDIANTS ENIM	8	Y.G.	RABAT
				TOTAL A CE JOUR	**160**		

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Exhibit 11

Tableau récapitulatif des résultats des visites de suivi- Projet GEM

Agroalimentaire

No	Societes	Projets identifies	Projets Realises	Economie identifiee Tep	Economie identifiee Dh	Economie Realisee Tep	Economie Realisee Dh	Causes de non réalisation pour les projets non réalisés seulement	Valeur des projets non réalisés Tep	Valeur des projets non réalisés Dh
1	LAITERIE	18	11	555	750,000	61%	63%	Etudes préalable	217	277,500
2	LAITERIE	18	12	485	920,000	62%	56%	Etudes préalable	184	404,80
3	CONSERVERIE	5	3	130	281,000	66%	66%	Manque d'assistance à la réalisation	44	87,919
8	CONSERVERIE	9	6	271	961,700	41%	54%	Finance et assistance à la réalisation	160	442,382
14	BOISSON	9	0	12	597,250	0%	0%	pas fait	12	597,250
22	SUCRERIE			0	0	0%	0%	En cours de réalisation		
26	LAITERIE	6	3	106	400,282	35%	28%	pas de contact	69	288,203
33	CONSERVERIE	5	4.5	41	117,500	75%	78%	Manque d'assistance à la réalisation	10	25,850
	Total	71	39.5	1600	4,007,732	905	1883828			
			56%		Realisation =	57%	47.0%			

Construction

No	Societes	Projets identifies	Projets Realises	Economie identifiee Tep	Economie identifiee Dh	Economie Realisee Tep	Economie Realisee Dh	Causes de non réalisation pour les projets non réalisés seulement	Valeur des projets non réalisés Tep	Valeur des projets non réalisés Dh
8	USINE CERAMIQUE	3	2	463	1,157,000	34%	35%	Etudes importants (+50%)	304.27	750,000
7	CIMENTERIE	9	9	2,907	4,400,000	100%	100%	Non applicable	0	0
13	CIMENTERIE	7	3	11,969	25,570,000	68%	38%	Etudes/programmes	3836.5	15,853,400
15	CIMENTERIE	2	0	939	2,224,000	0%	0%	Autres	939	2,224,000
20	CIMENTERIE	6	0	3,181	7,481,400	0%	0%	85% Programmes/ 20%manque assistance/15%autres/etc	3181	7,481,400
	Total	27	14	19,479	40,832,400	11218	14523600			
			52%		Realisation =	55%	35.6%			

Hotels

No	Societes	Projets identifies	Projets Realises	Economie identifiee Tep	Economie identifiee Dh	Economie Realisee Tep	Economie Realisee Dh	Causes de non réalisation pour les projets non réalisés seulement	Valeur des projets non réalisés Tep	Valeur des projets non réalisés Dh
4	HOTEL	21	16	172	638,224	85%	85%	Manque d'assistance à la réalisation	60	96,700
6	HOTEL	13	0	179	758,000	0%	0%	Problèmes organisationnels (fagnets / Décideur non lettres	179	758,000
9	HOTEL	15	0	206	636,000	0%	0%	Financier	206	636,000
11	HOTEL	10	3	93	349,600	16%	31%	Manque d'assistance à la réalisation/absence ADS	78	241,100
12	HOTEL	2	0	43	122,520	0%	0%	Organisationnelles/L'absence de DT explique la non réalisa	43	122,520
16	HOTEL	9	0	245	870,000	0%	0%	Etudes chaque fois qu'il est de l'argent	245	870,000
17	HOTEL	9	2	232	685,000	3%	6%	Finance et assistance à la réalisation	225	646,000
21	HOTEL	6	0	15	48,000	0%	0%	Organisationnel/Changement de directeur	15	48,000
23	HOTEL	6		63	172,000	6%	10%	Financier	58	154,800
24	HOTEL	4		50	127,000	0%	0%	Financier	50	127,000
25	HOTEL	11		130	429,000	8%	10%	Financier	120	386,100
29	HOTEL	6		71	182,600	0%	0%	Attente appr obtention	71	182,600
30	HOTEL	5		75	439,800	0%	0%	Attente appr obtention	75	439,800
31	HOTEL	4		44	130,300	0%	0%	Attente appr obtention	44	130,300
32	HOTEL	9	7	142	794,000	34%	76%	Manque d'assistance technique	93	189,100
34	HOTEL	3		32	257,000	0%	0%	Attente appr obtention	32	257,000
	Total	133	28	1792	6,939,044	199.93	1354024			
			21%		Realisation =	11%	20.4%			

Autres

No	Societes	Projets identifies	Projets Realises	Economie identifiee Tep	Economie identifiee Dh	Economie Realisee Tep	Economie Realisee Dh	Causes de non réalisation pour les projets non réalisés seulement	Valeur des projets non réalisés Tep	Valeur des projets non réalisés Dh
19	PAPETERIE	8	8	49	558,000	88%	59%	Bon exemple	7	227,000
35	CARTON & PAPIER	6	4	35	127,000	74%	59%	En cours	10	52,070
27	USINE TEXTILE	12	7	1837	4,531,000	49%	40%	Finance et assistance à la réalisation	937	2,714,970
28	SERVICES	2	2	198	784,000	100%	100%	Organisationnel / assistance à la réalisation	0	0
	Total	28	19	2122	6,000,000	1168	3005960			
			68%		Realisation =	55%	50%			

Total general	259	100.5	24,993	57,479,178	13,491	20,767,412	Valeur des projets non réalisés	11502	36,711,764
	Realisé =	39%		Realisation =	54.0%	36.1%			

Economie identifiee	57,479,178	Dh	
Realisations	20,767,412	Dh	36%
Economies non réalisés	36,711,764	Dh	64%

Exhibit 12

TABLEAUX RECAPITULATIFS:

Aspect énergétique et financier:

Action	Gains en Tep (Tep/an)	Investissement (Dh)	Gains (Dh/an)
Audits	27 941	86 385 600	65 000 000
ORE	3 431	4 419 900	4 600 000
ORC	1 737	Minime	3 700 000
Formation	13 650	--	19 110 000
Total	46 759	90 805 500	92 410 000

Le nombre de personnes ayant suivi la formation est de 546.

Aspect environnemental:

Action	SO_2 (t)	NO_x (t)	CO_2 (t)	Poussières (t)
Audits	117	168	38 558	34
ORE	14	21	4 735	4
ORC	12	17	3 995	3
Formation	57	82	18 837	17
Total	200	288	66 125	58

Aspect social:

Le nombre de postes crée par activité:

Action	Investissement	Gains
Audits	518	11 700
ORE	27	828
ORC	--	1 110
Formation	--	5 733
Total	545	19 371